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PRINCIPLES OF SURGICAL PRACTICE

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INFECTIONS IN SURGERY

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IN order to discuss intelligently the problem of "Infections in Surgery," it is first necessary to determine the causes of the infections. Strictly speaking, the correct answer is "bacteria," but from a practical point of view that answer is far from satisfactory. There can be bacteria in a wound or tissues with no clinical evidence of an infection. There can be local and general reactions to a wound, without suppuration, which may or may not be due to infection with bacteria. Again there may be suppuration in a wound without any evidence of invasion of that wound by bacteria. Many wounds containing bacteria will heal without any evidence of infection, while others supposedly free of them will develop the most virulent infection. Thus, the practical problem of infections in surgery is not so simple as the presence or absence of bacteria in the wound or tissues. There are many other factors which come into play in the determination of whether or not infection may occur.

As a matter of fact, there are now very few of us who believe it possible for a wound, either closed or left open, to be absolutely free of the presence of any bacteria, and this holds true for planned or surgical wounds as well as traumatic wounds. Then there must be factors other than the presence of bacteria, which have a marked influence upon the problem of infections in surgery. Today it is our plan to discuss some of them, as well as the part which bacteria play.

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In the early years of my career I witnessed many contradictions to my belief at that time in the absolute asepsis of wounds. They worried me because, to my surprise, infection rarely occurred. However, as I now recall, the "breaks in technique" were usually committed by masters of the technique of operating. I need not recall to this audience the errors in asepsis committed by Ochsner, Murphy, and many other great surgeons who rarely were annoyed by infected wounds. Yet, I do want to relate one personal experience which made a great impression upon me. Shortly after graduation from the medical school it was my exceptional privilege to assist Doctor Wm. S. Halsted in some experiments upon the large abdominal blood vessels of dogs. I would have the field of operation prepared with the most meticulous asepsis when he arrived in the laboratory. Frequently he would stop to discuss some new ideas which had occurred to him or me since the last experiment, during which time he gave his hat, cane, coat, and shirt to the diener. Finally, absorbed in his thoughts, he would "scrub up," which procedure on such occasions might appear to me to take an exceedingly short time. Then finding himself without cap and mask he would dry his hands on a laundered but unsterilized towel and carefully put on the cap and mask, after which he would put on his gloves and gown and be ready to operate. Or, if he was unusually absorbed in thought he might smoke one or two cigarettes between "scrubbing up" and putting on gloves, in order to discuss further new ideas

before beginning the work. I was young and anxious, and naturally trembled at the thought of infected wounds. Yet, in a series of more than 100 abdominal experiments there was not a single infection, and a year or more after an operation it was scarcely possible to see any abdominal scars. I believed in asepsis then as I do today and wondered why, with such obvious "breaks in technique," we did not get infected wounds. I was then obsessed with the idea of absolute asepsis and, for some time, did not fully appreciate the other things I was learning—things which, with the passing of years, have loomed very large in my mind as factors which often determine the incidence of infections in surgery. At this point, let me say that Doctor Halsted never operated upon a human being with any greater care than when operating upon animals. At times, he may have seemed very impersonal but, so far as I know, he never performed an operation on man or beast which was not done with the most perfect operating technique at his command, and my experience with him convinced me that any surgeon who believes that he can use an inferior technique when operating on animals is running a serious risk of impairing his skill as a surgeon.

In those early days in the laboratory everyone at the operating table, including the anesthetist, had his nose and mouth securely masked. Gloves were filled with a solution of bichloride of mercury before they were put on in order that the presence of any holes in them could be detected. The field of operation was covered with sterile Japanese silk soaked in collodion which, when dry, would adhere to the skin and allow the incision to be made through it. With this precaution, hands, instruments, and sponges never came in contact with the animal's skin. Doctor Halsted handled all tissues with the gentleness of a true artist's touch. I "wiped" a wound just once; since then my efforts to remove blood from a wound have been confined to the gentlest sponging, aspiration, or flushing with normal salt solution. Frequently when it was necessary to pack the intestines out of our way, they were first covered with thin rubber protective. If Dr. Halsted had any doubt about the sizes of silk which had been prepared for his use he would send for samples from the stock room, and if a mistake had been made he would wait until he got the very fine grade he wanted. All blood clots and detached bits of tissue were carefully removed. Fragments of tissue connected by stalks which might not nourish them were cut away. Sutures which, by chance, were tied too tightly were removed and replaced by looser ones. Sutures were not placed in muscle or fat. Tissues deprived of their blood supply and doomed to death by reason of a ligature were trimmed back close to the ligature. He always used a knife for dissecting, for he believed it less damaging to tissues than scissors. After the peritoneum was closed the wound was frequently irrigated with salt solution in order that surface bacteria, tissue juices, and dissolved fat be washed away. He was disappointed if any part of a wound looked blood-stained, contained hematomas, or, in any way, looked "chewed up" or traumatized. After having begun an experiment he would continue to work until he had closed the skin with the most meticulous care. I believe this was because of his great interest in wound healing, although he always had in mind his responsibility in the training of men who were working with him. Whenever a wound was reopened within a couple of weeks he was greatly interested in its appearance, the amount of necrosis, and the appearance of the granulation tissue, even though there was no infection.

With my sincere apologies for this rather lengthy description of my own experience with Doctor Halsted, I shall attempt to reduce what I learned from him and what little else I may have learned in the near quarter century since then to a few general principles.

1. Infections in surgery are not, by any means, due solely to the presence of bacteria in the wounds, for absolute asepsis is rarely, if ever, obtained.

2. Efforts to observe a rigid asepsis are perhaps the most important factor in the control of infections in surgery, but, with our present knowledge, do not justify the use of means which do damage to healthy living cells.

3. Healthy living tissues have a remarkable capacity to kill bacteria and, since we admit a doubt of absolute asepsis of any open or made wound, it is our duty to endeavor to free those tissues of any other handicaps which may make it impossible for them to cope with bacteria which may be present. Among these handicaps which may make a wound which would otherwise heal per primam become infected are:

1. Débris, blood clots, and dead or devitalized tissue. These substances not only put an extra burden upon the living cells which must grow and heal the wound, but are also excellent food for the growth of bacteria which are present.

2. Poor or improper nourishment for the cells which must repair the wound.

Today we can discuss only a few of the aseptic and antiseptic precautions, and procedures of

technique which, by reducing the burden upon the living cells that must heal the wound, may materially aid in the reduction of infections in surgery.

Doctor Allen O. Whipple will make a few remarks concerning the part which the choice and use of ligature and suture materials may play in the incidence of infected wounds.

Doctor Arthur Allen will give us a brief discussion of certain measures and procedures which may aid in providing the living cells with the most ideal food with which to do their work of healing a wound.

Doctor Michael Mason will give us a brief evaluation of the use of aseptic and antiseptic measures as they may affect the incidence of infections in surgery.

Doctor Urban Maes will discuss for us the subject of control of hemorrhage in fresh wounds and delicate granulation tissue, and the influence this may have upon the incidence of infections in surgery.

THE CHOICE AND USE OF LIGATURE AND SUTURE MATERIAL IN THE REPAIR OF CLEAN WOUNDS

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As surgeons we have to make incisions and repair wounds in our approach to diseased tissues and organs. We should be as much interested in ideal wound healing as in any one subject in surgery. It is only by studying wound healing processes, and keeping ever an open eye and mind to the factors entering into these processes, that we can improve our results and be discontented with what we had considered good in the past.

Doctor Reid has asked me to discuss the part which the choice and use of ligature and suture material may play in the incidence of infection in clean wounds.

In the repair of a clean incised wound, the following factors are of prime importance:

1. Dissection with a sharp knife.
2. Complete hemostasis.
3. The maintenance of as sterile a field as possible.
4. Protection of the wound edges with towels, and exposed surfaces with moist abdominal pads.
5. The use of as fine ligature and suture material as possible, with not more than twice the tensile strength of the tissue in which the ligature or suture is placed.
6. Minimum trauma with the maximum maintenance of the blood supply and nutrition of the tissues.

If these criteria are met, the incidence of infection in clean wounds can be reduced to 2 or 3 per cent, and by constant effort and vigilance it can be made to approach the vanishing point. However, beware of the surgeon who says he never has infection in clean wounds.

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I wish to discuss the fifth point; i.e. the choice and use of ligature and suture material. If one delves into the history of suture material since Lister made elective surgery possible, one will find that there was a trend in the seventies and early eighties of the last century to use catgut because of its absorbability, and because silk and linen, as then used in heavy grades, resulted in prolonged sinuses and infected wounds. However, in the hands of careful observers like Kocher, catgut resulted in wound infection in from 70 to 80 per cent of the cases. Kocher and a few other German surgeons changed over to fine silk with great relief and satisfaction. Halsted, who had observed Kocher in the early eighties, understood the underlying philosophy of silk technique and introduced it into the Johns Hopkins Clinic.

With the improved methods of sterilizing catgut, the serious infections, especially the anaerobic, were largely eliminated, and the majority of surgeons, not knowing how to use silk properly, wisely continued to use catgut as a suture material. However, with the growth of follow-up study in this country and the spread of a more critical attitude regarding surgical results in our best clinics, the subject of primary wound healing has been receiving more and more attention. No longer are we satisfied with impressions as to the percentage of infections in our clean wounds. Weekly, monthly, and annual tabulation of the individual case histories is now including figures on wound healing, and this has had a most salutary effect on our attitude toward wound repair.

Catgut has the advantage of absorbability, but in this quality there is a wide variation as to rate and time of absorption. Many factors, such as the type of catgut and its chemical preparation by commercial manufacturers, and the contact of catgut with gastro-intestinal ferments, necrotizing organisms, and allergic reactions, have made surgeons fearful of finer grades of catgut. As a result, heavier grades are used which require the use of large needles and hemostats, heavy instruments in general. In order to set and secure the knots much force is required; therefore there is a tendency to include too much tissue in the artery clamps and large masses of tissue in the suture line are deprived of blood supply because of the excessive tension in the continuous sutures. One sees Kocher clamps used as hemostats in many clinics and double No. 2 or No. 3 chromic catgut for a continuous suture in the repair of abdominal incisions—grades of sutures which are known to be from fifteen to thirty times stronger in tensile strength than the tissues which they are supposed to repair.

Catgut placed in the tissues absorbs fluid from the tissues, swells, and causes still more tension. This tension is quickly equalized by pressure necrosis so that within a day or two the suture rests at the inner end of an ellipse of necrotic tissue, and the tighter the suture has been tied the longer the ellipse. Furthermore, catgut acts as a culture medium for bacteria entering the wound, and if pour cultures are taken from experimental wounds made by parallel rectus incisions in which catgut is used on one side and silk on the other, the number of bacteria in the catgut side will invariably be found to be greater than that in the silk side. If, in addition to the bacteria, necrotic devitalized tissue is in excess, an infection will be much more apt to develop.

If catgut could be used in as fine grades as it is possible to use silk, the difference in wound healing with the two materials would probably be slight. However, silk can be used safely in such fine grades, both for ligatures and sutures, that the critical surgeon will adapt his team, his instruments, and his entire technique to the stronger and more delicate medium.

One should not attempt to use silk unless he is willing to change his technique and instruments. Silk should be used only in the finest grades and it cannot be used with heavy hemostats, heavy needles, and with the same amount of tissue inclusion in the ligature and suture line that one sees in clinics where catgut is used routinely. In this lies the essence and the philosophy of silk technique, for its use connotes minimal tissue damage and maximum maintenance of nutrition to the wound edges.

It requires more time because the technique is more meticulous. Interrupted sutures rather than continuous-layer sutures, a more careful hemostasis with more fine ligatures, a constant effort to tie sutures without tissue tension, these are all factors which develop in the critical surgeon a more deliberate attitude to accomplish a better repair.

I was not trained in the Halsted School, but the men with whom I had my early training in surgery—Clarke, Blake, Martin, and Lambert—were all intensely interested in wound healing and constantly emphasized the importance of minimal tissue damage. However, it was not until I adopted the use of fine silk in all clean wounds—and now in many potentially contaminated wounds—that I realized the possibilities of ideal wound healing. Since silk has been adopted by the men trained in its use in our clinic, the improvement in our wound healing has been so striking as to leave no room for argument, as to both immediate and late results.

TABLE I.—THE INCIDENCE OF SUTURE MATERIAL AND THE TYPE OF SUTURE USED IN THE ANTERIOR SHEATH

Material	No. of cases	F. & N. suture	Plain suture
Silk	300	228	72
Catgut	181	102	79
Control*	300	0	300
Total	781	330	451

*Cases in the control group were sutured with catgut.

TABLE II.—INFECTION IN CLEAN OPERATIVE WOUNDS

Material	No. of cases	Triv. inf.	Per cent	Ser. inf.	Per cent	Total inf.	Per cent
Silk	199	4	2.04	0	0.0	4	2.04
Catgut	25	1	4.00	0	0.0	1	4.00
Total	224	5	2.22	0	0.0	5	2.22
Control	53	4	7.55	2	3.77	6	11.32

TABLE III.—INCIDENCE OF DISRUPTION

Material	F. & N. suture	Per cent	Plain suture	Per cent	Total	Per cent
Silk	1	0.44	0	0.0	1	0.33
Catgut	4	3.92	1	1.26	5	2.76
Total	5	1.51	1	0.66	6*	1.25
Control	.	....	13	4.34	13	4.34

*Two cases have not been included in which dehiscence of the wound took place, because the separation of the wounds only extended down to, but not through, the anterior rectus sheath.

(Whipple, A. O., and Elliott, R. H. E., Jr.: The Repair of Abdominal Incisions. Ann. Surg., 1938, 108: 741.)

NUTRITIONAL FACTORS INFLUENCING WOUND HEALING

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THE rapidity of wound repair in the healthy, well nourished individual, as compared to the slow unsatisfactory healing often observed in a patient in a deficiency state, makes it necessary to bear in mind certain precautions in this respect. Too often we deal in generalities as regards the type of skin preparation, aseptic technique, trauma, and suture material without taking into consideration the effect of age, disease, and biochemical faults on cell proliferation. The majority of wounds occur, or are made, in the comparatively normal, healthy person, and we are prone to base our experience on the way and manner which such wounds heal as a standard for all surgery. Thus, we find our interns removing sutures on the seventh day with complete assurance regardless of the disease for which the patient was operated upon or his state of nutrition, as since the accepted time for healing has elapsed, there should be no doubt concerning the state of repair. They are inclined to accept dehiscence as an uncontrollable disaster or an Act of God which of necessity must occur in a small percentage of cases. Before nutritional states were understood and the effect of these on wound repair was known, we learned by experience that in the very young, in the aged, and in patients who had been operated upon for gastro-intestinal carcinoma, a careful wound repair, with non-absorbable sutures placed through skin, fat, and fascia, and tied loosely, could be safely left in place for two or three weeks with the avoidance of many unnecessary wound disruptions. We realized that for some reasons, then only partially understood, repair under certain circumstances was retarded. Much has been learned concerning these factors in recent years, and by correcting certain chemical faults, fluid balance, and deficiency states, one can expect repair to take place in a more normal manner.

The division between chemical faults and nutritional states cannot be a sharp one since often they are found together, or one is dependent upon the other. It may be best to consider the problem more or less in a general manner. In many patients requiring surgery, there is no emergency and plenty of time may be spent in correcting existing deficiencies prior to operation. Often this can be accomplished only partially because of the effect on the individual of his primary lesion, but certainly all practical preparation should be carried out and every known helpful procedure utilized. When it is obvious that no further improvement in the patient's condition can be expected, then the choice of operation must be considered. If the situation is one that can be handled more safely by stage operations, then it should be so planned. Often a preliminary short circuit or proximal bowel drainage may be done, which may allow a more complete correction of the existing faults before the lesion itself is attacked. A preliminary jejunostomy, for feeding in patients unable to take adequate nutrition by mouth, often allows one to accomplish a serious operation with greater safety. In those individuals requiring an emergency procedure, one must combat the chemical and nutritional faults as vigorously as possible immediately and carry these adjunct procedures along until health is restored. One looks back on many patients whose lives were lost, in spite of an excellently accomplished surgical operation, because of the lack of understanding of the effect of deficiency states on repair.

Water imbalance is perhaps the most frequent serious fault encountered and fortunately the easiest to correct. With fluid loss the chlorides in the blood are often low, particularly when this has taken place through vomiting. Thus, salt and water can be replaced by clysis or by intravenous solutions. Glucose affords the simplest and most effective means of artificial nourishment of the cell and in many cases one needs only to administer in the correct manner a suitable amount of water, salt, and sugar.

One should, in patients who have been ill a long time and those with certain depleting disorders, take other known factors into consideration. Anemia should be corrected by blood transfusion in the acute cases. Liver and iron will help in the more chronic states and aid in maintaining a normal blood level during the recovery from acute blood loss. Often one finds a low protein level in the blood and this situation will affect wound healing materially. Certainly many of the malfunctioning stomas in the gastro-intestinal tract are due in large part to the edema coincident with hyperproteinemia. One sees evidence of this

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in the healing of superficial wounds and of surgical incisions as well. So far, the only satisfactory method of combating this situation in the acute stage is by blood transfusion. If one can arrange for the absorption of protein from the intestine by feeding this substance by mouth or through a jejunostomy as early as is practical, a more normal state can be obtained.

The effect of vitamins on deficiency states and thus on wound healing is now established. There is considerable experimental and clinical evidence that Vitamin C is particularly important in this respect. The ascorbutic-acid level in the blood can be determined by laboratory test. Frequently time or facilities do not allow for this procedure. Since it has been shown that the unusable excess of cevitamic acid is safely excreted through the kidneys, it seems justifiable to use the substance empirically by mouth and by the intravenous route in surgical patients who may have been on a deficient diet prior to operation or who, by reason of their surgical lesion, cannot resume a normal diet at an early date after operation. It is likely that the other water soluble vitamins, particularly nicotinic acid, may also be proved of importance in wound healing.

ASEPTIC AND ANTISEPTIC MEASURES AS THEY AFFECT THE INCIDENCE OF INFECTIONS IN SURGERY

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THE discussion of surgical infections at this noonday conference has emphasized those factors which promote or interfere with wound healing, and which discourage or favor the development of infection. It has been pointed out that bacteria are present in practically every surgical and accidental wound, and that whether or not they produce infection depends upon the ability of the body cells to resist them. It is generally agreed that every effort should be made to free wounds of bacteria and prevent bacteria from entering them, but the measures taken should not harm the tissues, the healing of which we are trying to promote. Whether or not we can accomplish this removal will depend, in general, upon two factors: the length of time which has elapsed since the bacteria were introduced into the wound, and the degree of acclimatization of these bacteria to growth in human tissue fluids.

We have come to distinguish clinically between wound contamination from natural extraneous sources and contamination from human sources, and in our examination of a patient with an open wound we try to ascertain the possible sources of the bacteria with which his wound is contaminated.

When bacteria from natural extraneous sources are introduced into wounds they do not at once begin to proliferate; they require a certain amount of time to adjust themselves to growth in the human medium. This time interval probably varies with different bacteria and different tissues, but, in general, some time between the fourth and sixth hour after inoculation, bacterial growth starts. During this period of time the bacteria apparently lie on tissue surfaces and may be looked upon as mere contaminants amenable to removal. After this period of acclimatization has passed, bacterial growth has started, tissue reaction will have begun, and the wound, instead of being simply contaminated, is infected.

Obviously, every open wound so contaminated does not become infected, even if no measures are taken to prevent it or to remove bacteria from it. Equally obvious is the fact that many wounds, even under ideal treatment and conditions, do become infected. However, it is logical to attempt to rid the wound of the contaminating bacteria before growth and proliferation have started, that is, within the first four or, at the most, six hours. The temptation has been to pour various sorts of antiseptics into the wound in the hope of destroying the germs. This illogical practice has persisted in some form or other to the present day, even though the goal of an antiseptic which harms only bacteria has never been attained. Not only does the use of antiseptics fail to destroy all of the living organisms, but, more important still, it injures the living cells so that they are less able to cope with the bacteria that are left behind.

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It is more logical and efficacious to rid wounds of bacteria mechanically, in such a way that the tissue cells may not be harmed. Friedrich, on the basis of his experiments, suggested that wounds be completely excised within from four to six hours after they have been incurred. Without doubt, this method of complete wound excision is efficacious; however, it is not universally applicable, nor is it necessary, and excision should be restricted to the removal of tissue of which the vitality has been so lowered by the trauma that it cannot survive.

Contaminating organisms from natural extraneous sources, in that "vegetative condition in which bacteria find themselves in the external world," may be removed from wounds and washed from tissue surfaces within from four to six hours after the injury by the conscientious use of soap and water, and irrigation with normal saline solution. This procedure thoroughly carried out under aseptic conditions, first by washing the surrounding skin and then the wound for at least ten minutes each, does not harm the tissues and leaves us with a wound that is surgically clean and amenable to repair and closure.

When we come to consider the wound contaminated directly or indirectly from human sources, the situation is different. Bacteria which are introduced into a wound from the fingers, from the respiratory tract of the examining surgeon or bystanders, from instruments hastily taken from the doctor's bag, from unsterile instrument trays in the emergency room, from a knife or needle used in a post-mortem examination, or from human bites, belong in a different category. Such organisms are not only often extremely virulent, but they are already acclimated to human tissue and grow almost at once after they have been introduced. Wounds so contaminated must usually be considered to be infected at the time of inception. So far as I know, no one has established the exact time limit within which immediate cleansing would be efficient. Certainly the pouring in of antiseptics has not helped, and early operation has never been anything but disastrous.

I think this distinction between natural and human sources of contamination has a very direct bearing upon our management of open wounds, and I should like to cite briefly two illustrative instances.

A boy of six was playing in an alley and sustained an extensive laceration of the wrist from a broken bottle in a rubbish heap. He was seen within a very few minutes by his uncle, a doctor, who simply covered the wound with a sterile dressing. The boy reached the hospital within an hour, when the dirt-contaminated wound was washed with soap and water, and irrigated with normal salt solution. An extensive nerve and tendon repair, lasting over three hours, was performed. The wound healed by primary intention and with complete return of function of all of the divided structures.

A man of thirty-eight slipped on the stairs and in falling thrust his right hand through a window and sustained two lacerations of the wrist. The wound bled furiously and the physician who was called applied hemostats and ligatures to the radial and ulnar arteries. The patient was then taken to a nearby hospital where the wound was cleansed in the emergency room, and additional ligatures were applied. He reached the operating room in less than four hours after the injury. There was no gross contamination and a lengthy primary repair seemed justified. Twelve hours after operation, however, the temperature suddenly rose to 104 degrees and the patient presented the picture of extreme toxemia. The whole wound had to be re-opened and other measures taken to combat the infection. Luckily, the patient survived, but with extreme loss of tissue.

With one exception, both cases were treated in like fashion. In each, the wound was washed and repaired by the same surgeon, in the same manner. The wound which was grossly contaminated with dirt from the alley rubbish heap healed without reaction and with complete functional recovery. The other, a clean laceration from a window pane, developed a life-threatening infection with serious loss of tissue. The only essential difference in the management was the nature of the first aid. In the case of the boy, the wound (dirt and all) was simply covered with a sterile dressing bandaged on snugly, which was not removed until the patient was in a well-equipped hospital and all precautions had been taken to prevent secondary contamination. In the case of the man, considerable first aid had been rendered, first in the home, probably with several unmasked spectators about, and again in the emergency room where ample opportunity had been afforded for contamination from human sources.

It has come to be my feeling that many of the wound infections which we see are not due to the organisms which get into the wound at the time of the injury, but to bacteria which are introduced during efforts at first aid. Copious hemorrhage, anxious relatives and friends, insistent demands for immediate treatment, often lead the physician or first-aid man to do things which cause irreparable damage.

We teach our students that first aid of open injuries should be simple. The wound should be covered with a sterile dressing bandaged on snugly; a splint applied right away will minimize secondary mechanical damage and will add greatly to the comfort of the patient; antiseptics should not be poured into the wound at this or at any other time. Upon reaching the hospital, all inspection of the wound should be carried out under the same aseptic precautions that one would use in any aseptic procedure. The mouth and nose should be masked, instruments should be sterile, hands should be scrubbed, and rubber gloves should be worn. It is needless, of course, to add that the operative repair of the wound should be done with the same care and aseptic technique that is accorded the clean operation.

The organisms from natural sources introduced at the time of the injury, may usually be washed from the wound, provided it can be seen within the four to six-hour period and the wound may be repaired and closed. The organisms introduced by unsterile hands, droplets, contaminated instruments from unclean medical kits, and unsterile dressings contaminated from human sources cannot be removed. Wounds containing the latter must be considered to be infected and must be so treated. When a patient presents himself with an open injury it is very important to inquire carefully into the nature of the first aid. A few minutes spent in questioning impatient friends and relatives may save the surgeon a great deal of embarrassment, and the patient a stormy period of infection.

THE INFLUENCE OF CONTROL OF HEMORRHAGE AND PROTECTION OF DELICATE GRANULATION TISSUE IN WOUND HEALING

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WHEN two-stage operations are demanded in the best interest of the patient, the surgeon must forget his "batting average" and abandon hope of primary wound healing. On the other hand, all surgeons aspire to a high ratio of primary wound healing, and must keep in mind certain fundamental principles to attain this objective. Others on the program will consider the patient himself, and the equipment used in the operation; I shall confine my remarks to certain specific facts concerning the wound.

The statement that every surgical operation is an experiment in bacteriology implies that all wounds contain bacteria. This is true. It is impossible to eliminate all sources of contamination. Even when all other sources are eliminated, bacteria are inevitably liberated during the course of the operative procedure from the depths of the sweat glands and hair follicles. The aim of the surgeon must therefore be to keep the tissues in the best possible condition to take care of the bacteria which will be present despite the most meticulous asepsis.

The normal process of repair, reduced to its ultimate simplicity, consists of two steps: (1) the formation of fibrin, which literally glues the edges of the wound together; and (2) the proliferation of vascular buds and young fibroblasts, the complete organization of which results in the formation of adult fibrous tissue or scar tissue. The permanent healing of all wounds depends upon these two processes.

The small, thin scar, with nearly exact approximation of like tissues, is the ideal to be achieved. The granulations in the wound must therefore be protected against trauma, which injures the growing cells. The interposition of any material which prevents accurate contact of the wound surfaces must be avoided. Infection, which injures the growing cells and prevents accurate contact of the wound edges, must be prevented. Finally, mechanical separation of the wound surfaces must also be guarded against; the most frequent causes of this accident are the presence of blood clots, accumulations of serum, and devitalized tissue.

In the normal process of repair, when the space between the two wound surfaces has been

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Round Table Conference, Clinical Congress of the American College of Surgeons, New York, New York, October 18, 1938.

bridged by healthy granulation tissue and all débris has been absorbed, bacteria can no longer grow and produce infection because of the high degree of immunity exhibited by young fibroblasts and angioblasts. If, on the other hand, the accurate apposition of the healing surfaces is prevented by the presence of blood clots, serum, or devitalized tissue, then excellent culture media are provided on which bacteria may grow unchecked and from which, as a nidus, they may invade surrounding living structures.

The care of wounds at the time of operation calls for the strict observance of several fundamentally important rules:

1. A clean, deliberate incision must be made with sharp instruments, which means that dissecting scissors and blunt dissection are to be employed as little as possible.

2. Hemostasis must be adequate. Vessels must be clamped and ligated with as little suture and ligature material as possible. All sutures, whether catgut or silk, are foreign bodies, and the presence of foreign bodies militates against primary wound healing.

3. The area in which the wound is located must be immobilized and kept at rest. Failure to observe this rule is followed by the formation of hematomas and the accumulation of a serosanguineous fluid, which usually make their appearance just when the patient is apparently well and is ready to be discharged from the hospital.

The use of local anesthesia plays a more important part than is generally realized in the failure to achieve primary wound healing. In a study made some years ago on operations for inguinal hernia, I pointed out that the percentage of failures in primary wound healing because of the development of infection was materially increased when a local analgesic was used. The wound is dry at the time of closure, probably because of the use of adrenalin to hold the anesthetic solution in the tissue, but when the effect of the adrenalin has disappeared, a small amount of bleeding occurs. Thus, as I have already pointed out, pabulum is furnished for the growth of bacteria, wound healing is delayed, and the scar tissue that is formed is greater than the normal amount.

In our studies of wound disruption in abdominal operations we have been able to find no single factor responsible for this catastrophe. The age and condition of the patient play their part, but are not adequate explanations. Suture material may be partially responsible, but in many instances it is possible to demonstrate that the tissues themselves give way, and not the material used to approximate them. Vitamin and plasma protein deficiencies are present in some cases, and introduce the thought of a constitutional factor. However, none of these factors, in my opinion, overshadows the importance of inefficient hemostasis, which permits the formation of hematomas, the collection of serum, and the devitalization of tissue.

The frequency of wound infection and wound disruption will be diminished by careful hemostasis, by the use of the finest suture material, and by the ligation of vessels with as little surrounding tissue as possible. Perfection of technique is our aim, but it has not yet been achieved.

Questions and Answers

Question: Does the Wangensteen suction apparatus help to reduce the incidence of abdominal infections?

DR. REID: Anything which will reduce abdominal distention and thus take tension away from the abdominal wound will certainly lessen the amount of necrosis from the sutures and thus reduce the incidence of infection. I am sure that all of us recall instances of abdominal wounds which healed per primam and yet developed a large postoperative hernia. In many such cases marked abdominal distention tightens the sutures and produces an extensive necrosis, even though the wound apparently heals per primam. I certainly believe that the wise use of the Wangensteen suction apparatus will definitely prevent infection of many abdominal wounds.

Question: Does the use of the electric high-frequency current knife make the wound more liable to infection or slower healing?

DR. REID: There is a strong temptation for the operator to use the coagulator too freely in the control of hemorrhage and thus leave in the wound a very large amount of unnecessary dead and damaged tissues. From such a careless use of it, no doubt, there result many infections. I have seen some wounds so charred by its free usage that they looked to me as if they should be given a careful débridement before closure. I, personally, feel that the actual amount of tissue necrosis is usually greater from coagulation than from the careful use of small ligatures. Besides, as I have said, when one is using ligatures he will not likely tie unnecessarily so many bleeding

points as he will coagulate if he is using the coagulator.

Question: What part do you think anesthetics play in infections in surgery?

DR. REID: In abdominal surgery I think they play a very important part. The surgeon must, as a result of a poor anesthetic, "fight" the intestines and use strong retraction. There can be no question but that the amount of trauma will be greatly increased, and trauma, as you know, predisposes to infection. I would personally rather delay opening of the abdomen for from twenty to thirty minutes, if necessary, in order to have a quiet, smooth period of anesthesia than open the abdomen earlier and have to contend with the patient's struggling during the procedure of operating. In surgery in other parts of the body, straining may not be such an important factor in leading to necrosis, but there is the feeling of many people that anoxemia over a long period of time definitely reduces the ability of the tissues in the wound to combat infection.

Question: Do you believe in the surface washing of so-called aseptic wounds?

DR. REID: It is very difficult for the operator to detect with his eyes bits of detached tissue and I believe that it is very important to wash nearly all wounds before closing them. We have done this for many years and are constantly surprised by the large amount of dissolved fat and bits of tissue which can be recovered from a wound which appears to be clean. Besides, we have the feeling that a careful washing with normal salt solution poured into the wound from a considerable height will remove a large majority of the surface bacteria, which always get into a wound. We know this is true, because we can usually get a bacterial culture from the washings of any wound. The washing also floats up bits of muscle and tissue which are attached by such tiny pedicles that probably they cannot survive. Most of these can thus be recognized and removed.

Question: Do you use silk in dirty cases: for example, in a ruptured appendix?

DR. WHIPPLE: Silk should not be used in cases in which purulent exudate or infected tissue is anticipated, especially in the closure of incisions requiring drainage of an intestinal abscess.

Question: Would you advise using a fine running catgut suture in the peritoneum, then silk closure outside?

DR. WHIPPLE: As a rule, silk and catgut should not be used in the same abdominal incision. However, in the peritoneum catgut can be used for the peritoneum and posterior rectus sheath, with interrupted silk for the anterior sheath, because of the separation of the two by the muscle layer. Fine silk in the peritoneum will give a more secure closure with less chance of a disruption or postoperative hernia.

Question: Is silk used on all abdominal cases, as appendectomy, cholecystectomy?

DR. WHIPPLE: I use silk in interval appendectomy and in cholecystectomy for chronic cholecystitis.

Question: How do you measure the force with which ligatures and sutures should be tied?

DR. WHIPPLE: If interrupted fine silk sutures are used at 1 cm. intervals, the repair will be adequate. The sutures should not be tied tighter than to approximate the tissues and the suture should be so fine as to break easily if the tissue is more than approximated. Silk should not be used if the operator cannot tie it without its breaking with undue tension on the tissue. This applies to ligatures as well as to sutures.

Question: What is your opinion of alloy steel wire as a suture material?

DR. WHIPPLE: Alloy steel sutures are from 10 to 30 times stronger than the tissue in which they are used. Non-absorbable sutures do not need to have more than twice the tensile strength of the tissues which they approximate. A suture as strong as steel wire encourages tight tying and the strangling of the tissue in which it is used. I can see no advantage in the use of steel alloy except for the through-and-through suture for closing abdominal incisions with infection present.

Question: How do you feel about the prevalent use of sutures in fat and muscles?

DR. WHIPPLE: Fat and muscle are so easily cut through by pressure or tension necrosis that attempts to approximate them for more than a few hours are futile. Careful hemostasis and closure of the wound by suture of the fascial and aponeurotic layers, and skin accomplishes all that can be done and reduces the amount of foreign-body suture material.

Question: What size silk is used in closing an abdominal wound?

DR. WHIPPLE: In the repair of clean abdominal wounds, 0 silk with the tensile strength of 3 pounds is used for the peritoneum and posterior rectus sheath, a similar grade for the anterior rectus sheath in interrupted sutures at 1 cm. intervals, and No. 1 for the skin in silk interrupted sutures.

Question: What do you think of through-and-through sutures with, for example, silkworm gut?

DR. WHIPPLE: For several years I have given up through-and-through retention sutures for the closure of clean abdominal incisions. I use

steel alloy wire or No. 1 silk through all the layers of the abdominal wall, including the skin, at from 1 to 2 cm. intervals in closing grossly contaminated incisions, especially when cough, distention, vomiting, or hiccough is expected.

Question: How about the use of sulfanilamide as a prophylactic in peritonitis?

DR. ALLEN: I have had no experience with the use of this drug in the treatment of peritonitis, nor am I aware of any report on the subject. Peritonitis is rarely caused by the beta hemolytic streptococcus. Rarely does the gonococcus cause a death from peritonitis. I believe that most of the organisms causing fatal peritonitis would probably be unaffected by sulfanilamide or any of the newer derivatives that have so far been discovered. For these reasons, I do not believe one would be justified in further lowering the patient's normal recuperative powers by the use of sulfanilamide as a prophylactic measure in peritonitis. If one should culture an organism from the peritoneal cavity that is known to be affected by this drug, its use might be effective.

Question: What is the influence of bichloride solution on infected wounds and on tissue?

DR. ALLEN: Bichloride of mercury in a sufficiently strong solution to have much bactericidal power within an infected wound will also destroy living cells. A very weak solution may not actually kill growing cells but when used for irrigation it is not any more effective in ridding the wound of infection than normal salt solution. Cells will grow in a bath of Dakin's solution which will, if properly used, keep bacteria at a low ebb; but even this will at the same time retard cell growth. However, infected wounds may do better with such treatment than without it since the bacteria, if left alone, will kill cells, as they grow, more effectively than a correctly titrated Dakin's solution. I am sure that bichloride of mercury solution should be discarded in the treatment of fresh or infected wounds. Also, I feel very strongly that we should banish this solution from our operating rooms. Since it is an irritant to normal tissue, it disturbs me to see surgeons wash their gloves in it and then proceed to handle the intestine and other delicate living tissue.

Question: What is the best preparation of skin?

DR. MASON: There are many methods used today for the preparation of the skin of the operative field. They are all in agreement on one point: the skin should be properly cleansed and, if necessary, shaved. The differences have largely to do with the treatment which the skin receives after it has been carefully washed. For washing there have been recommended dozens of chemical agents, and each is claimed to be superior to the others on the ground that it is less irritant but just as efficient as its rivals. The truth of the matter is that, to a certain extent, they are all irritant, though it must be admitted that certain of them have proved practically harmless so far as skin reaction is concerned. However, no one of these agents is efficient unless the skin has been properly cleansed with soap and water beforehand. If the skin has been washed carefully with soap and water, almost any of the antiseptics commonly used seems efficient. Curiously enough, however, if the skin has been washed carefully with warm, sterile water and soap just before operation, and no antiseptic whatever is applied, there is even a lower incidence of postoperative infection than when an antiseptic is used. It has seemed to me, therefore, that while antiseptics are possibly only slightly harmful, they are certainly of no value, so I have discontinued their use in the pre-operative preparation of the skin, in favor of a ten-minute washing with soap and water. Needless to say, this washing should be done gently, with large cotton pledgets, frequently changed; it cannot be done perfunctorily, and should receive the same care that the surgeon uses in washing his hands. In the pre-operative preparation of such fields as the mouth, where micro-aerophilic and anaerobic organisms are present, the work of Meleney has shown that zinc peroxide used as a mouth wash tends to reduce the incidence of postoperative infection.

Question: What is the effect of drying of the tissues during an operation?

DR. MASON: There is no doubt that delicate tissues are often severely damaged by exposure to the air and the heat of the operating lights. How extensive this damage may be we do not know; but it is possible to kill tissues, or to lower their vitality so that they are less resistant to infections. In operations in the abdomen, the surgeon is always very careful to keep the exposed bowel covered with warm, moist sponges, to prevent drying, but this precaution is too often forgotten in the case of other tissues. It is good practice, as far as possible, to keep exposed tissues covered with sponges which have been moistened in normal saline solution. If this is not possible because of the nature of the operation, the wound may be frequently irrigated with salt solution. This serves not only to keep the tissues moist, but to wash out fat cells, blood, and débris, as well as bacteria which have fallen into the wound from the air.

Question: Do you prefer moist or dry dressings on closed wounds which you expect or hope will heal per primam?

DR. MASON: The answer depends entirely upon what is meant by a moist dressing. Certainly the hot wet pack should not be used on any wound in which primary healing is anticipated. Such a pack stimulates an exudative reaction, leads to swelling, increases tension on sutures with necrosis of tissue, and predisposes to wound complication. It is my practice, however, to lay over the suture line of clean wounds, two or three small gauze sponges wrung out almost dry in normal saline solution, and then to cover the wound with large amounts of fluffed gauze, which are bandaged on snugly. It has seemed to me that such a dressing conforms nicely to the wound and, because of its slight amount of moisture, absorbs the few drops of serum and blood which ooze out through the suture line.

Question: What about the prophylactic use of gas-bacillus antitoxin?

DR. MASON: It is difficult to establish the prophylactic value of gas-bacillus antitoxin, since it is well known that the infection may develop after the use of the serum. Some statistical studies of the World War seem to indicate that after prophylaxis with antitoxic serum, gas-gangrene infections were markedly reduced. However, it is the general feeling among surgeons that while the antitoxin is of value and should not be omitted in instances in which contamination is likely, it does not have the prophylactic value of tetanus antitoxin. Eliason and his coworkers in Philadelphia have shown that if gas-gangrene antitoxin is used and an infection subsequently develops, the process is less severe than in cases in which the antitoxin has been omitted. It must be remembered, however, that the use of antitoxin does not compensate for neglect in proper cleansing of the wound. The wound must be cleansed and carefully freed of all crushed and devitalized tissues, especially muscle. The antitoxin is an adjunct to careful surgery, but is not a substitute.

Question: Should the anesthetist be required to wear a mask? the patient? the orderlies?

DR. MASON: Every person who enters the operating room should wear a mask covering the mouth and nose. Many surgeons still object to covering the nose, but there is no more excuse for leaving the nose uncovered than there is for leaving the mouth uncovered. Meleney's studies of postoperative wound infections have shown definitely that hemolytic streptococci from the upper respiratory passages of persons entering the operating room may gain entrance into the operative wound and cause severe infections. This source of wound contamination can be controlled only by the adequate masking of surgeons, assistants, nurses, orderlies, in fact, of everyone who enters the room. While it is not general practice to mask the patient, I think it is advisable, unless operation is performed under general anesthesia.

Question: From the standpoint of prevention of infections, do you prefer dividing the gut with the cautery or the knife?

DR. MAES: I prefer to use the knife. The contamination resulting from this method is less likely to lead to infection, because of leakage or spill of the intestinal contents, than the devitalization of the cut ends of the bowel when the cautery is used.

Question: Do you think the frequency of dressings bears a definite relation to the incidence of infection in surgery?

DR. MAES: I do. Repeated dressings of a clean wound serve no useful purpose. The disturbance of the wound which is caused by the manipulations and trauma of repeated dressings interferes with healing. Furthermore, bacteria are much more likely to be introduced by this procedure than they are to be killed by the bright colored antiseptics usually painted over the wound.

LESIONS OF THE TONGUE

Collective Review

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RADICAL operative removal of the tongue for carcinoma is seldom done at the present time, but it is interesting to note that a large number of authors recommend dissection of the cervical lymphatics if there is any promise of a local cure with radium or local operation (22 articles of 26 reviewed). Such uniformity of opinion points to the conclusion, at least for the present, that dissection should practically always be done on the side of the involvement and that close watch should be kept on the opposite side so that it can be done there too at the first suspicion of metastasis. (This is not suggested as a critical review, but may be of some statistical or reference value to those interested in the work. Recognition is due to Dr. George Crile, two of whose articles are referred to here, because of his pioneer efforts in dissection of the neck for carcinoma.)

CARCINOMA OF THE TONGUE

Roux-Berger and Tailhefer (42) of the Curie Foundation of Paris, in a paper entitled, "The Removal of Neck Glands in Bucco-Pharyngeal Cancer," state that the principle is exposure of the retrostyloid space to remove the jugular vein high and easily. They believe that neck dissections should always be done unless there is superficial or deep fixation of the glands. And in the cases involving the tongue, neck dissection is still more important and should be done early; and, furthermore, if it could be done routinely early, there would be fewer hopeless cases. The scar and disability are recognized as being bad, but they are of minor importance in the matter of getting rid of a cancer. The authors have removed the digastric muscle 23 times without trouble and have done 212 operations with only 6 deaths; all this before 1927.

Duval (17) from the Institute of Cancer of Paris, in an excellent article entitled, "A Point of Technic in the Removal of Neck Glands for Cancer of the Tongue—The Operation from Back to Front," expresses the principle of exposing the retrostyloid space to get to the jugular bulb and removing all tissue in one block from the back, forward. This technique was used at The Institute of Cancer of the Faculty of Medicine of Paris for one year without a death and under regional block anesthesia.

Ducuing, Fabre, and Gouzy (15) of Paris, especially in carcinoma of the tongue, expose the retrostyloid space for the jugular ligation by cutting the upper end of the sternomastoid muscle away as well as the digastric and stylohyoid muscles. The importance of dissecting the whole neck in one block is stressed, and the anterior part of the digastric muscle is removed also.

It is the custom of Cooper (11) to treat the primary carcinoma of the tongue first and allow a period of about four weeks to elapse between the treatment of the primary growth and that of the cervical area. The reason for adopting this method, which has given satisfactory results, is based upon the necessity of giving the patient the best possible blood and lymphatic supply to the area treated. This is an all-important matter. The disappearance of the tumor is hampered by the removal of the lymphatics and ligation of the blood vessels, and is, of course, the object of the block-dissection operation on the neck. Therefore, the treatment of the neck is left until four weeks after the radium treatment of the tongue. The local lesion is treated with radium element needles of 1.33 mgm. and the average total dose is 1,200 mgm. hours.

The patient is instructed to appear for examination once every week for four weeks when the treatment to the cervical lymph glands is planned out. There is no doubt that, in the present state of radium therapy, surgery is to be given preference in treatment of the neck. The question does not arise if the glands are palpable. In such cases surgical removal is the treatment of choice. All enlarged glands are not necessarily malignant, but operation offers the best possible chance of preventing metastases. The debatable point is whether one is justified in doing a block dissection when glands are not palpable. In the author's experience, it appears that operation under local

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anesthesia is the safer method, and should be carried out in every case four weeks after radiation of the primary lesion. Any operation short of a complete block dissection has nothing to recommend it. The operation aims at removal of all glands (including the submaxillary), deep fascia, the sternomastoid muscle, and the internal jugular vein.

When glands are found on both sides, the operation is performed on the second side after the lapse of a fortnight, and obviously the internal jugular vein must be removed on the more affected side.

In inoperable cases complete surgical removal is impossible. It is the custom to bury needles and hope for the best. This procedure must often be supplemented by injections of snake venom, various hypnotics, and analgesic drugs.

Searby (44) maintains that, in the majority of cases of carcinoma of the tongue, death is indirectly the result of metastasis to the cervical glands. There is no doubt that x-ray therapy acts unfavorably toward the process of metastasis, but there is also much evidence that in many cases surgical excision with careful clean dissection will prevent metastases or, if they have already developed, will remove them. A cure will depend on the extent of the metastases and the amount of direct extension. The primary growth on the tongue can be cured by excision if the principles of cancer surgery are applicable. However, if radical surgery is not feasible and one wishes to avoid mutilating operations, it is necessary to fall back on the selective action of radium treatment. It seems that a proper dose of radium is capable of melting away grossly cancers of the tongue, even in those advanced cases in which surgical excision would not be possible. Each case, however, must be treated individually. A hard and fast rule is not possible. The removal of all teeth before any treatment is started is advised, as this is the surest way of avoiding later infections.

Schurch (43) on the basis of surgical and radiological literature and of personal experience, gives a survey of present methods of treating oral tumors. Particularly in these tumors, a combination of therapeutic measures is applicable. Radiology and surgery share equal importance in this treatment. A close co-operation between these two methods of treatment may be of great value in the improvement of the heretofore ungratifying results of treatment. Schurch considers the routine biopsy not to be of great danger and the means of some prophylactic measures, such as clearing up precancerous formations (leucoplakia and erythroplasia). Under treatment he discusses electrosurgical methods, the application of radium (surface application, the implantation of needles, and distance radiation), and roentgen therapy. It is here distinctly emphasized that the aforementioned type of x-ray therapy is not less effective than electrosurgical treatment. The electrosurgical attack should be the first choice for small, well localized tumors. Radium therapy in the form of implantation is limited in its use because of technical difficulties encountered. The large inoperable tumors are treated by x-ray therapy. Small tumors, especially those with a favorable prognosis, are to be treated surgically as radically as possible. In every case radical gland dissection of the glands should be done, preferably after x-ray therapy to the region. Only the few, very radiosensitive tumors are primarily treated with x-ray therapy.

Wookey (51) summarizes that in 54 per cent of the cases of carcinoma of the tongue, the primary disease was controlled by radiological methods. Sooner or later in most patients there was an invasion of the regional lymph glands; and it is thought probable that surgical dissection of the glands might wisely be done before any enlargement can be demonstrated because this seems to offer the best hope of control of the disease in the neck. The results of treatment of other intra-oral cancers are much more satisfactory than those obtained when the tongue is involved. Most of these primary lesions have disappeared under radium therapy and the results of early and radical dissection are encouraging. Operations for removal of portions of the jaw have proved of great value in the treatment of a good many of these cases and can be done fairly safely.

Donati (14), immediately after biopsy and microscopic diagnosis, implants radium in the tumor of the oral cavity or pharynx. After at least thirty days, to allow for subsidence of all local and general reaction to radiation, the radioresistant lymph nodes in the neck are removed surgically. Two to three weeks later a course of x-ray therapy is given to the site of operation. Thirteen patients with tumors of the tongue, cheek, and tonsils were treated in this manner with good early results, but too recently to permit opinion as to recurrence. The very radical surgical management of the usually radioresistant lymph nodes of the neck is described in detail with many illustrations. Local anesthesia is used with intravenous dilaudid-scopolamine pre-operative medication. If necessary, one may remove the posterior belly of the digastric and the stylohyoid muscles to gain the best access to the jugular bulb region. It is impossible to do this radical operation bilaterally at one sitting because of ligation of the internal

jugular vein and also because of complete removal of the sternomastoid muscle. The results with regard to *recurrence* will have to show whether this very radical operation is justifiable. In most instances, the lymph nodes behind the sternomastoid muscle are involved; furthermore, the supraclavicular and the submental glands must be removed since their status can be determined only histologically. Contraindications are retropharyngeal, surgically inoperable metastases, and invasion of or adhesions of the metastatic mass to the carotid artery. In addition, in the opinion of the author, one must exclude radium-resistant primary lesions of the buccal cavity and pharynx. The relatively metastatic-free cancers of the anterior half of the tongue may be exempt from this radical dissection but should remain under careful observation. The method of treatment must be suited to the individual case.

Seemen (45) reports a case of a large carcinoma of the tongue with metastases in the floor of the mouth and in the submental region in a man fifty-seven years of age. The patient had electrocoagulation of the growth four and one-half years ago, with removal in layers. The lymph glands were excised and since that time there has been no recurrence.

Stanford Cade (8) states Wallace's summary on glands:

1. If no glands are palpable, surface radiation is employed.

2. (a) If glands are palpable but operable, if the condition of the patient is good, and there has been a good, local response to treatment of the primary growth, they are removed by a block dissection.

(b) If removal of glands is not advisable, open or closed needling (radium) is employed.

3. If the glands are inoperable, they are given primary treatment with deep x-rays followed either by surface application of radium or needling.

Results of radium treatment for all kinds and stages of cancer in a total of 337 cases: 33.5 per cent of the patients were well from seven to ten years.

In 225 cases with tongue involvement 33.3 per cent of the patients were well from seven to ten years; 18.7 per cent from five to six years, and 11 per cent for seven years. The author believes that mass radiation with from 2 to 6 gm. of radium is best although the method is still in development, and he states that "radiation is a purely local remedy and has no influence on the subsequent development or dissemination of the disease."

Chase (10) states that neck dissections should be done if the case is not too unfavorable locally; otherwise, x-rays should be used. No results are given.

New (36) gives the following results in 162 cases with involvement of the tongue:

		Five-Year Survival
Nodes negative, but dissected	59	29
Nodes negative, not dissected	40	19
Nodes positive, and dissected	57	8

Hutchison (26) advocates block dissection in operable involvements and as prophylaxis in practically all cases.

Crile (12, 13), has obtained five-year cures in 25 per cent of 549 carcinomas of the buccal cavity, in those cases which, after operation or radium treatment of the primary growth, underwent neck dissection.

Kaplan (27) uses radium treatment locally for carcinoma and then neck dissection if the nodes are movable and intact. When complete resection cannot be done, as much as possible is removed and the remaining malignant tissue is irradiated directly with radon or element of 200 mgm. hours per c.cm. of malignant tissue. No results are given.

Livingston and Lieber (30) recommend both surgery and irradiation in carcinoma of the tongue, but leave the question of metastasis to others and give no results.

Morrow (33) presents a moderate departure from the usual present-day report on carcinoma of the tongue, in 98 cases at the New York Post-Graduate Hospital.

His article is summarized, as follows:

1. All of the cases showed carcinoma microscopically and two-thirds of them were advanced. Neither size nor microscopic grading of the cancers proved of much prognostic value among the cases treated surgically; the operative mortality was 26 per cent, but during the last five years it has dropped to 16.7 per cent. The highest mortality was from 40 to 50 per cent and occurred in the cases with tongue and gland operation combined. Twenty per cent of all of the patients treated surgically survived five years or more; 32 per cent of those without node involvement and 11 per cent of those with node involvement revealed five-year cures. The best results were obtained when the two-stage operation was done, removal of the tongue first and then of the glands. Postoperative radiation was not used as a routine measure. Poor local results were obtained with radium and surgery, and *only 10 per cent primary healing with radium alone.* Five-year cures should be obtained in 30 per cent of the cases without node involvement; in cases with node involvement

they will probably amount to less than 10 per cent. Successful treatment depends on keeping ahead of the disease and this should best be done by routine neck dissection whether the glands are palpable or not.

Eggers (19, 20) is one of the most enthusiastic authors in favor of neck dissection and he states that, even in carcinoma of the tonsil, surgery has a definite place in the early cases, and, as soon as the area is clean postoperatively, a radical neck dissection should be done on the side involved and then one on the opposite side if necessary. (No results are given.)

Berven (2), in Stockholm, has used teleradium treatment in 457 oral cancers, with 25 per cent five-year cures. Teleradium is given first, then surgery or interstitial irradiation of the residual areas, and neck dissections are resorted to if the nodes do not disappear.

Forssell (22), in Stockholm, reports 113 cancers of the buccal cavity, 75 per cent of which were inoperable but gave 18 per cent five-year cures with radium alone. In operable carcinoma of the tongue without gland involvement, radium treatment gave five-year cures in 55 per cent; operation in the same condition, in 41 per cent. Gland metastases, if inoperable, are treated by irradiation alone, preferably teleradium. If no glands are palpable, operation is not done but the teleradium treatment is used; however, Forssell had no patients with cancer of the mouth with gland metastases who became well with radiation treatment alone. With combined surgery and irradiation 7 of 20 of his patients remained alive for three years and 2 of 5 for five years.

Trotter (48, 49) reports pharyngeal growths cured by pharyngotomy, excision, and neck dissection in some instances. He states that radium treatment might also be used, but he reports operative results because he knows most about them. An interesting explanation is given of late recurrences depending on loss of active immunity to parts of carcinoma left behind after from five to seven years.

Moure (34) gives the following late results of surgical treatment of carcinoma of the tongue: of 57 patients operated on, 23 survived from two to six years.

Fraser (23) operated on 68 cases of oral carcinoma without gland involvement, 23 per cent of which were reported cured after two years; of those with gland involvement, 3.8 per cent were reported cured after two years.

Pfahler and Vastine (37) treated 396 unselected carcinomas of the mouth (not including lips) with radiation with cures in 29 per cent, and with their present technique are obtaining 39 per cent. The authors think from 50 to 75 per cent of the patients should get well if treated properly by irradiation.

Blair, Brown, and Byars (4, 5, 6, 7) have made neck dissections a routine procedure in carcinoma of the tongue, and, although it would be best to be sure of primary healing from the treatment of the local disease, there have been enough inoperable extensions into the neck during a waiting period to indicate that the gland removals should be done soon after if not right at the time of the radium treatment. Both Butlin and Whitehead practiced preliminary gland removal before operating on the tongue, but this urgency has not been found necessary.

Stewart (47) of Memorial Hospital, New York City, advocates narrowing down indications for neck dissection and relies mainly on the interstitial treatment method of Janeway and Quick. He states further that nearly all patients come in for treatment with glands uninvolved or hopelessly involved.

Duffy (16) and Quick (40) present practically the same ideas as outlined under Stewart.

Holmes (25), in 14 statistical tables of the results of treatment of carcinoma of the tongue, presents the reports of 8 large hospitals in the 6 largest provinces of Australia. These hospitals have for a number of years had a uniform system of recording cancer cases, and have carefully followed up the cases after discharge of the patients. This system of reporting cancer cases and following them up had its origin in 1929 after the government had distributed its radium. The statistics of the results in treatment of cancer are inclusive of the years from 1929 to 1932. The cases are divided on the basis of the anatomical site of origin and the extent of the disease, into the following groups:

1. Cancer which is limited to the tongue and shows no clinical evidence of involvement of the regional nodes.

2. Cancer in which the tongue and floor of the mouth are involved without clinical involvement of the lymph nodes.

3. Cases in which there is secondary involvement of the regional nodes clinically from a cancer of the tongue.

4. Cases in which the cancer of the tongue or floor of the mouth has invaded adjacent bone.

The number of patients falling into Groups 1 and 2 that were treated by surgery alone is relatively small; yet the results do not appear as favorable as in those treated by a combination of surgery and irradiation, or those treated by irradiation

alone. Of 112 patients in Groups 1 and 2 treated by the various methods, 28 per cent were living from three to six years later; of 163 patients in Groups 3 and 4 only 7 per cent were living. Twenty-five per cent of those that died had no demonstrable metastases or recurrence. In 40 per cent of these the primary lesion of the tongue was probably healed, but the cause of death was secondary cancerous growths. In 65 per cent of the patients who died, therefore, the treatment was of value even though death ensued. Of 146 patients in Groups 3 and 4 who died, 61 had had healing of their primary lesion at some time, regardless of whether metastases or recurrence had taken place. Even if the treatment increased the life expectancy by only one or two years, a good part of the pain and suffering was alleviated by it. In closing, the author urges closer co-operation between the surgeon and roentgen therapist because in many cases the best results can be offered by combined surgical and roentgen treatment.

MUSCLE TUMORS

Morpurgo (32) described 2 cases of myoblastoma of the tongue. The first was a small benign lesion (after classification of Abrikossoff) without inflammation of the tongue. The myoblastic cells were found to lie in the connective tissue of the muscle layer and extended into the mucosa up to the epithelial border. The muscle bundles were infiltrated by tumor cells. These cells pushed into the layers of the internal perimysium and produced atrophy and absorption of the striated muscle fibers. In the interstitial tissue about the vessels and nerves, the myoblasts formed thick layers of concentrically or spirally arranged bundles. The individual myoblasts were most often of short, cylindrical, or plump spiral forms with an occasional oval or round cell.

Cappell and Montgomery (9), in reporting 6 tumors of striated muscle, discussed the classifications. They proposed two groups, rhabdomyoma and myoblastoma. The former are defined as tumors in which a proportion of cells shows unequivocal transverse and longitudinal striations, the latter as tumors in which the cells resemble muscle cells but are devoid of transverse striations. In this group there were 2 rhabdomyomas of the soft palate and 1 myoblastoma of the tongue.

They believe the tongue is one of the most common sites for tumors arising from muscle cells, and emphasize the importance prognostically of differentiation of rhabdomyomas from myoblastomas. The former, growing from a mucous surface, tend to assume a tabulated polypoid form with clubbing of the ends of the processes, and the whole mass is suspended from a narrow pedicle. These tumors have a tendency toward local recurrence in spite of extensive surgical removal and are disseminated through lymphatic channels, in this process, like carcinoma; regional lymph-node metastases are, therefore, the risk.

The myoblastomas are generally rounded nodules in the substance of the tongue, only slightly raised above the surface. Local removal may be followed by freedom from recurrence and apparent cure, although examples of malignant nature do occur, as the 1 case described by the authors.

CONGENITAL LESIONS OF THE TONGUE

Kolesov (29) reported a case of congenital deformity of the tongue and hard palate. The deformity consisted in a cleft in the hard palate and in the tongue, the latter appearing as a double tongue. In addition, there arose fold-like swellings of the gums and of the tongue, which, at the age of six months, caused difficulty in breathing and had to be removed.

Proskauer (39) reported a case of congenital cavernous hemangioma of the tongue in a girl two and one-half years old. On the basis of this case and previously published observations, the author concludes the importance in treating congenital tumors which may occur in any part of the body. Morphologically benign, these growths may, through their location and growth, become very unpleasant to the individual. This is true especially of hemangiomas of the tongue which are usually small at birth but grow rapidly at intervals. Early treatment is urgent, whether in the form of surgery, chemical means, or some physical agent. Total extirpation is the best but not always feasible choice of removal. Therefore, eradication is tried by ligature, freezing with carbon dioxide, alcohol injection, cauterization, electric needling, and radium irradiation. Often results are obtained only after using various methods at the same time or in rapid succession.

Kindersley (28) reported a large arteriovenous aneurysm, involving the right side of tongue, the floor of the mouth, and the submaxillary area, present since birth. Division of the lingual, facial, and the superior thyroid arteries gave abolition of the thrill which had been present, but, within a few days, the thrill reappeared and the tumor was no smaller in size. A very large sinus ruptured at re-operation, and to control hemorrhage the common carotid was exposed lower in the neck and a tape passed around it. The common carotid was controlled by this means and the pack withdrawn, and no appreciable diminution in the flow of

blood was noticed; therefore, the tape was removed and the hemorrhage controlled by a gauze pack. It was presumed, therefore, that some large anastomosis existed with the vessels of the opposite side.

Federspiel (21) reports cases of macroglossia producing abnormalities of occlusion and respiration, and recommends reduction of the size of the tongue by marginal excision around the entire edge rather than V-excision, which may be applied to either lymphatic or muscular hypertrophies. He cautions that occasionally a seeming macroglossia may be due to a dermoid tumor under the tongue.

CHONDROMA OF THE TONGUE

Pless (38) states that chondromas are common but rarely appear on the tongue. Only 8 cases have been reported at the present time, 1 chondroma occurring at the tip of the tongue; this was described by the author, with 3 illustrations. There was a walnut-sized pedunculated osteochondroma present on the tip of the tongue, which was excised in 1934. The origin of this growth was probably attributable to an injury in the form of a tongue bite sustained in 1918.

LIPOMA OF THE TONGUE

Duvoir, Pollet, and Herrenschmidt (18) reported a case of bilateral and symmetrical lipoma of the tongue, and reviewed the literature.

Smith (46) states that lipoma of the tongue is very rare, and reports the successful surgical removal of a huge growth in a woman of fifty-six years.

TUBERCULOSIS OF THE TONGUE

From a clinical point of view, Binstok (3) divides cases of tuberculosis of the tongue into three groups. The first includes patients with a positive sputum in which the tuberculous process is often localized near the tip of the tongue, or at the sides where carious teeth have caused slight abrasions. The ulceration is superficial, spread is by continuity, and the progress of the lesions is relatively slow. When associated with a chronic type of phthisis this form of tuberculosis of the tongue is very amenable to treatment by deep cauterization or local excision of the ulcers. When the ulceration is deep with involvement of the lymphatic glands no surgical treatment should be attempted. In these latter cases the best method of treatment is with x-rays. The second group consists of cases associated with a general dissemination of the tuberculous infection. The lesions begin deep in the substance of the tongue, the infection being deposited there by one of the numerous arteries; the onset is usually sudden. The tongue becomes swollen, but there is no ulceration for a long time; mastication and swallowing become extremely painful. Surgical treatment is contraindicated, and only x-rays and analgesics may be used. If the general resistance is poor such lesions go on to deep ulceration. If the resistance is good a tuberculoma of the tongue forms without ulceration. The third group includes ulcerations near the lingual tonsil, which spread by means of the lymphatics. Such lesions occur in phthisical patients who have undergone operations in the mouth and pharynx, such as tonsillectomy or partial excision of the glottis. The few cases reported in the literature have been treated by applications of carbon-dioxide snow, and section of the glossopharyngeal and superior laryngeal nerves to relieve pain. Statistics show that cases of tuberculosis of the tongue form approximately 50 per cent of all the cases of tuberculosis of the mouth cavity.

Martin (31) reports the case of a patient with a lesion that he has called primary tuberculosis of the tongue because in a thorough laboratory and clinical study of the patient no evidence of tuberculosis was found elsewhere.

It is of the utmost importance to have a dark-field examination made of all long-standing ulcers of the tongue to rule out syphilis.

Biopsy should be done in all cases of ulcers or lesions of the tongue of any appreciable duration or size.

If the lesion is tuberculous, a cure can be obtained by excision.

Munro (35) demonstrated 5 specimens illustrative of the varied manifestations of tuberculous disease of the tongue.

He referred to the comparative infrequency of the condition, but pointed out that it was not unknown for a patient to seek advice on account of a painful ulcer of the tongue, while old-standing pulmonary tuberculosis was overlooked.

In his experience he has never seen a primary case of tuberculous disease of the tongue. All of his patients showed lesions occurring almost as terminal phenomena. No treatment was given.

SYPHILIS OF THE TONGUE

Ramond (41) reports a case of multiple ulceration of the dorsum of the tongue in a patient with a positive Wassermann reaction, pathological fractures, and Charcot's joint, which was cured with adequate antiluetic treatment.

Tsuzuki (50) found that about 70 per cent of ranula cases are syphilitic; for example, 23 of 32 cases were proved to be syphilitic by the Wasser-

mann test. Histologically, the syphilitic changes in the cyst wall and the surrounding sublingual glands were seen. Inoculation tests in rabbit testes of cyst walls were positive. Syphilitic ranula cysts can be cured easily by simple drainage of the cysts and the administration of antisyphilitic treatment.

INFECTIOUS PROCESSES

With regard to infectious processes of the tongue, Amit (45) reported 15 acute inflammations. There were 3 cases in his series of abscesses at the base of the tongue treated by incision and 7 of diffuse inflammation which subsided. He distinguishes between deep phlegmonous infections which require immediate surgical treatment and peritonsillar inflammations which are treated conservatively.

Grigsby and Kaplan (24) conclude from a review of 12 cases that abscess of the tongue requires prompt and adequate incision. Because of the precarious condition of the tissues surrounding the air passages on account of local infiltration, each patient must be carefully examined before the type of anesthesia is chosen. These authors prefer a posterolateral incision because it allows quicker healing and there is less chance of hemorrhage. In the 12 cases reviewed, there were no complications or deaths. In previously reported cases 3 deaths were due to (1) aspiration pneumonia following spontaneous rupture of the abscess, (2) acute edema of the glottis, and (3) hemorrhage.

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ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

EYE

Lane, L. A.: Occupation in Relation to Ocular Cancer. *Am. J. Ophth.*, 1939, 22: 267.

This detailed and well classified study brought out the fact that the number of cases of cancer of the eye over a period of from seven to thirty years in many of the clinics shows no increase. The number of cases in each type runs constant. The only rise was in the number of cases of sarcoma immediately following influenza epidemics.

The following facts should be given attention by ophthalmologists when taking cancer-of-the-eye histories. It is exceedingly important to know how long a patient has followed his occupation; likewise, whether any other occupation was followed previous to the present occupation and, if so, how long that occupation was pursued. These questions often have an important medicolegal bearing. Instances are found in the literature and in this survey material in which a patient suffering with a cancer had changed his occupation. This change in occupation had for a time led to a decrease in the growth. Such a patient should be classified under the primary occupation and is not entitled to compensation.

The exact nature of the duties of the occupation should be noted. Is the patient working more or less constantly with known cancer irritants? It is urged that every person who takes a cancer history of the eye get a complete and full history of the patient. Details are of importance in solving the cancer problem. Good follow-up records are of great importance in cancer work. Eye clinics, unfortunately almost without exception, have not been in the habit of following up their tumor cases. In the institutions for the study and treatment of malignant disease, the records are far better, and good follow-up work has been going on in many of them for more than five years. LESLIE L. MCCOY, M.D.

Gifford, S. R., and Marquardt, G.: Central Angiospastic Retinopathy. *Arch. Ophth.*, 1939, 21: 211.

This type of retinopathy occurs in young or middle-aged adults, usually men, showing no generalized hypertension. It affects the macular region and is characterized by symptoms and changes in the fundus which can best be explained as the result of spastic contraction of the smaller retinal arterioles or capillaries supplying this region.

Temporary closure of the central retinal artery or one of its main branches is well known, and a few cases have been seen while the artery was closed and again when it had refilled, but a permanent visual-field defect usually remained. Young persons without other signs of vascular disease may be affected.

In a second group of cases closure of the retinal arteries is seen in association with similar changes elsewhere in the body, especially in the extremities. Cases have been reported of retinal arterial spasm in patients with Raynaud's disease and Buerger's disease. Marchesani has also seen recurring hemorrhages in the vitreous in patients with Buerger's disease.

The present discussion concerns the picture of central retinopathy resulting from constriction of a number of smaller vessels supplying the macular area. Various names and theories have been used in referring to similar conditions appearing in the literature. These are discussed and their similarity to the cases presented is shown. In some of the reports syphilis and tuberculosis were considered to be contributory or causative factors. In all of the group of cases reported here the Wassermann reaction was negative, and none of the patients showed evidence of tuberculosis. In the present series of 8 cases the usual examination, supplemented by a careful history with respect to subjective symptoms of coldness and paresthesias of the extremities, was taken. Blanching of the hands or feet in cold weather or after washing in cold water is suggestive of peripheral angiospasm. Trophic changes are uncommon in cases of recent angiospasm, but there is usually flushing or blanching of the skin with change of position. Temperature changes of the skin occur to a greater degree in angiospastic individuals after nerve block and after smoking. Oscillometry affords a direct method for measurement of the filling of peripheral arteries, and repeated readings during treatment give a means of measuring its effect. Capillary microscopy of the bed of the toenail or fingernail is a convenient means of studying the peripheral circulation. In persons with angiospastic disease the number of visible capillaries is decreased by from 30 to 40 per cent. The caliber of the capillaries is decreased and the capillaries show the phenomenon of "plasma-skimming" in which segments of the capillary are empty of red cells, while closely packed cells are seen proximal to the narrowed portion.

In the cases reported the history and findings left no doubt as to the circulatory origin of the condition observed. Evidence of inflammation was not present. Objective evidence of angiospasm was definite, and was corroborated by the improvement noted during anti-spasmodic treatments. None of the patients showed evidence of syphilis or tuberculosis, and when focal infection was present it seemed doubtful if it should be considered as anything but a contributing factor. It is conceivable that a shower of toxic material thrown into the blood stream might

produce angiospasm in this vulnerable region in a person with an especially labile vasomotor system.

These findings confirm the opinion of Horniker regarding the cases reviewed by him, but his term "central angiospastic retinitis" would be improved by substituting the term "retinopathy," descriptive of a pathological condition without the implication of an inflammatory origin.

It must be emphasized that ophthalmoscopic findings are minimal in the early stages of the condition, and that when overlooked the diagnosis of retrobulbar neuritis is likely to be made. Careful examination of the macular region with the fine beam of the Friedenwald ophthalmoscope, with the Gullstrand ophthalmoscope, or by means of a red-free light will reveal signs of retinal edema.

Treatment includes avoidance of tobacco and exposure to cold, and freedom from psychic trauma, worry, and excitement. The nitrites are efficient vasodilators, but their action is transient and the untoward symptoms sometimes unpleasant. The intravenous administration of typhoid vaccine causes vasodilatation in doses of from 10 to 25 million organisms, much fewer than are usually employed to cause fever. Papaverine hydrochloride in doses of ¼ gr. (16 mgm.) given intravenously is the most potent vasodilator, and may be given three or four times a day, but it was seldom given oftener than once a day. An insulin-free pancreatic extract was used with apparent benefit, being given subcutaneously in doses of from 1 to 3 c.cm. Twelve weekly injections are given, and the course is repeated after an interval of a month. When hyperemotionalism is a factor, the barbiturates may be sufficient to relieve spasm. Metabolic disturbances should be corrected, and when the metabolic rate is low, circulatory efficiency is increased with thyroid extract. These measures must be continued for a considerable time.

EDWARD S. PLATT, M.D.

NOSE AND SINUSES

Sheplar, A. E., Spence, M. J., and MacNeal, W. J.: Serum Therapy for Streptococcic Infection of the Nose, Throat, and Ear, and Its Complications. *Arch. Surg.* 1939, 38: 206.

A survey was made of 30 patients suffering from severe infection with hemolytic streptococci in the otolaryngological region. Four patients with complicating meningitis and 15 whose blood yielded bacteria on culture were treated with streptococcus serum of three different kinds, together with other therapeutic measures, including transfusions, sulfanilamide, and bacteriophage in certain instances. There were 7 deaths and 23 survivals.

The early use of serum may be expected to be successful almost always, but because of the effort and expense involved, serum therapy will usually be reserved for the more severe cases. The authors recognize that streptococcus serum will not and probably should not be used for streptococcic infections of moderate severity, which may be adequately controlled by the oral administration of sulfanilamide. When, however, a really grave situation arises in a case of streptococcic infection, the proper use of the serum brings a promise of important aid which should not be neglected.

In the all too frequent streptococcic infections of the nose, throat, ear, and mastoid, the use of sulfanilamide or of serum, or of the two in combination may be expected to control the infection and to obviate the necessity of operative procedures. For example, mastoidectomies for streptococcic infections, which formerly constituted about 90 per cent of the mastoid operations, will become less frequent when modern chemotherapy and serum therapy for streptococcic infections of the upper part of the respiratory tract and of the middle ear are adequately employed. The success already achieved promises even more for the future development of chemotherapy and specific biotherapy of these infections.

NOAH D. FABRICANT, M.D.

Collins, E. G.: Osseous Affections of the Maxillary Sinus. *J. Laryngol. & Otol.*, 1939, 54: 121.

The authors reports in some detail several interesting cases involving the bony walls of the maxillary sinus. Some of the cases are very rare and are of interest chiefly from the scientific aspect.

JAMES C. BRASWELL, M.D.

MOUTH

Kazanjian, V. H.: Secondary Deformities in Cleft Palate Patients. *Ann. Surg.*, 1939, 109: 442.

Kazanjian discusses the problem of secondary deformities in patients with cleft palate. Since the treatment or neglect of certain aspects of the primary deformity is so often a factor in the development of secondary defects, a brief survey is made of the accepted methods of treating the original deformities. Of prime importance is the improvement of the speech of the child and the treatment of various secondary deformities of the face and the dental mechanism. In patients with cleft palate speech defects are principally due to inability of the soft palate to completely close the nasopharyngeal sphincter so that it may function adequately. Secondary deformities of the nose, the upper lip, the alveolar process, and the hard palate are quite common. Defects of the nose and lip, no matter how extensive, may be repaired surgically with fairly good results, but the reconstruction of the underdeveloped maxilla is a difficult problem.

Most surgeons agree that the defect of the lip should be closed within the first month after birth, if the baby is healthy enough to be a good operative risk. There are several standard methods of repairing lips but the method that answers the following qualifications should be given preference: (1) it should involve a minimum amount of operative trauma; (2) it should be designed toward bringing the separated parts into their normal anatomical position as much as it is surgically possible; (3)

for the sake of the immediate result it must not unnecessarily sacrifice skin tissue; and (4) it must include correct approximation of the nostrils as an important element of the surgical problem.

The two-stage or multi-stage procedure for cleft palate seems to be gaining in popularity, as it is a simple method, causes a minimum amount of trauma to the soft tissues, and also decreases the percentage of operative failures. In general, the patient is rehospitalized about one year after the repair of the lip. In the operation, the mucoperiosteal tissue is elevated from the bony palate through the usual lateral incisions close to the gingival margins of the teeth, and only the hard palate and alveolar cleft are repaired at this time. At this stage no attempt is made to separate the nasopalatine aponeurosis from the posterior edge of the palate bone. The purpose of this first operation is to close the clefts of the hard palate and the alveolar ridge with minimum operative trauma. A few months later a second operation is performed and the soft palate is closed.

The greatest cause of failure in the cleft-palate operation itself is infection, which manifests itself usually after the fourth day following operation. This infection originates in the nasal cavity; therefore, it is important to operate when nasopharyngeal infections are not prevalent in children.

In patients with cleft palate nasal deformities, in general, may be grouped under the following types: (1) distortion and flatness of the nostril on the side of the original defect; (2) in addition to the above, the entire nose may be bent to one side because of the peculiar development of the nasal bones and the septum; and (3) a broad and flat tip, often seen in bilateral cleft lips characterized with short columella.

Resection of the septum is often found to be necessary because of marked deviations. In shaping the entire nose it may be necessary to reduce an oversized hump of the nose to a straight line, or to narrow the tip, or perhaps to shorten the nose. Finally, the most important step is the correction of the distortion of the nostril itself, which is really a typical cleft-palate deformity.

In the treatment of the flat tip in bilateral-cleft cases it has been advisable to increase the vertical diameter of the columella and to narrow the tip of the nose. Minor defects of the upper lip in patients with cleft palate, irregularity of the lower border and distorted conditions of the vermilion border, are readily repaired surgically provided that the underlying support, the teeth and the alveolar processes are well developed and normal in outline. In gross deformities with pronounced retraction of the lip, the principal cause of deformity lies in the retarded development of the upper jaw and distortion of the teeth. In such cases the author instructs the patient to go to his dentist and have all the teeth requiring care repaired or removed, and in some favorable cases refers the patient to an orthodontist.

The author cites 8 illustrative case reports at the conclusion of the article. NOAH D. FABRICANT, M.D.

Gardham, A. J.: The Classification of Buccal Neoplasms in Relation to Treatment and Prognosis. *Lancet*, 1939, 236: 677.

Gardham's object in reviewing his experience with 84 cases of carcinoma of the mouth is an attempt to provide more reliable standards by correlating variations in malignancy with gross pathological characteristics. He omits to a large extent questions of microscopic pathology.

Growths of the lip pursue a benign course purely by virtue of their site of origin. Growths of the cheek resemble those of the lip up to a point, but statistics regarding their curability vary widely. The malignancy of these growths depends more on the stage of advancement and less on other pathological characteristics, than is the case with other growths of the mouth; hence it is safe to apply the standards of carcinoma of the lip to growths of the cheek which have not extended beyond the soft tissues. Growths which are more widespread react quite differently. In the author's series, it was found that 4 of 5 lesions remained healed for four years or more, whereas no patient with a large growth survived longer than two years.

A less common growth, which runs a stereotyped course, is carcinoma of the floor of the mouth. This tumor forms a very well-defined type which is often not recognized. The lesion starts always in the region of the orifice of the submaxillary duct and spreads widely but superficially in the floor of the mouth; it finally attacks the mucous membrane covering the lower alveolus. At the same time it spreads upward on the surface of the hyoglossus toward the dorsum of the tongue where, in moderately advanced cases, a dimple marks the point to which the tumor has extended. Glandular invasion is nearly always late. As regards both its local reaction to treatment and its metastasizing power, this growth is very benign.

The anterior part of the tongue does not impose any particular course on the tumors which arise in it; in the posterior third, both squamous-cell carcinoma and lympho-epithelioma occur, and it is by the manner in which the tumors spread rather than by their site of origin that the most reliable indications are to be obtained. The only other type of growth which runs a course which is decided purely by its site of origin is carcinoma of the lower alveolus. This tumor shows no tendency to spread superficially, and the external signs are limited for many months to a narrow fissured ulcer on the surface of the alveolus. The spread of the tumor is entirely into the bone of the lower jaw which causes considerable destruction.

Valuable information regarding malignancy may be gained by observing the manner in which a tumor spreads. Thus, ulcerated tumors of the anterior part of the tongue, which have not interfered with free protrusion, have generally proved to be of low malignancy. Mobile tumors of the tongue which are not

ulcerated are commonly characterized by wide submucous spread. This type shows a ready response to irradiation in the primary growth and the immediate metastases, and has a strong tendency toward the formation of remote metastases within five years of its onset.

The author found that surgical treatment of glands, classed as doubtfully operable on account of their extent, has produced immunity from recurrence for more than four years in 2 cases, whereas attempts at radical excision of easily operable glands which have become involved unduly early have proved uniformly disastrous.

In a few cases, prompt realization of the high malignancy of an apparently localized growth made curative radical treatment a possibility. Evidence of very high malignancy should be regarded, in other cases, as an indication for restricting the scope of treatment so as to aim deliberately at palliation. Irradiation in doses which do not cause immediate damage to normal soft tissues may be freely used in the treatment of all growths of high malignancy, for late effects seldom come into the picture. In growths of low malignancy, when long life can be expected, the need for caution is greater than is commonly supposed.

The damage caused to normal tissue by irradiation is difficult to assess, but evidence is rapidly accumulating that it is largely a question of liability to subsequent necrosis, and of increased susceptibility to independent malignant growths. The decision between operation and irradiation must not be made purely on the grounds of radiosensitivity.

The author classifies most of the growths he describes into one of three classes, according to their malignancy and their accessibility. Class A consists of neoplasms which are accessible and do not show any of the characteristics of high malignancy. It includes most carcinomas of the lip and most small carcinomas of the cheek. In these growths both operation and irradiation give excellent results.

Class B consists of growths which are inaccessible, but again show none of the characteristics of high malignancy. To this class belong carcinoma of the floor of the mouth, carcinoma of the epiglottic region, and a proportion of the pharyngeal and antral growths. These are curable by irradiation unless they actually invade bone.

Class C includes growths which exhibit the signs of high malignancy. Operations designed for treatment of these cases must necessarily be extensive and mutilating, but are seldom justifiable.

NOAH D. FABRICANT, M.D.

PHARYNX

Hauser, I. J., and Brownell, D. H.: Malignant Neoplasms of the Nasopharynx. *J. Am. M. Ass.*, 1938, 111: 2467.

The authors state that malignant neoplasms of the nasopharynx often manifest themselves by symptoms which are extranasal in nature.

Cervical swellings, changes in the tympanic membrane, unilateral deafness or a stuffy sensation in one ear, pain in the head or throat, diplopia or rectus-lateralis paralysis, or unilateral paralysis of any cranial nerves call for careful examination of the nasopharynx.

All malignant neoplasms arising from the lining epithelium of the nasopharynx appear to be medullary squamous-cell carcinomas. Lympho-epithelioma and transitional-cell carcinoma are believed to be highly undifferentiated forms of squamous-cell carcinoma.

Irradiation is at present the only form of treatment. In spite of the poor results, chances of arresting or destroying the neoplasm would be greater if earlier diagnoses were made.

The nasopharynx should be given careful routine inspection by the otolaryngologist.

JAMES C. BRASWELL, M.D.

NECK

Blewett, J.: Laryngocele. *Brit. J. Radiol.*, 1939, 12: 163.

A laryngocele can be defined as an air-containing cyst which arises from and communicates with the cavity of the larynx; the cyst may remain entirely within the larynx or herniate through the laryngeal walls into the soft tissues of the neck. The disease was first described one hundred years ago by a surgeon of Napoleon's army of occupation in Egypt.

Arising from the anterior end of the sinus of the larynx is a small diverticulum called the saccule or appendix of the laryngeal ventricle. If the saccule becomes distended with air, there is little anatomical hindrance to its presentation into the anterior triangle of the neck around the posterior border of the infrahyoid muscles. In most cases cited in the literature a factor which would cause distention of the saccule by an abnormal increase in the intra-

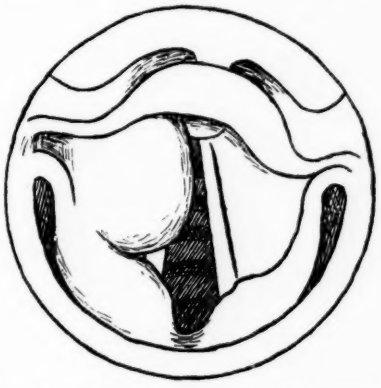

Fig. 1. Appearance of the larynx at the height of the obstructive attack.

laryngeal air pressure has been sought and found. Thus, the development of a laryngocele has followed coughing in pertussis and croup, straining during childbirth, extreme muscular effort, vomiting, politzerization of the middle ear, tuberculous perforation of the larynx, and glass-blowing.

From the foregoing it would seem that the appearance of laryngocele depends on these conditions: that an abnormally developed saccule becomes distended by increased air pressure into the larynx; that by this pressure it may be protruded beyond the confines of the larynx; and that edema of the mouth of the saccule may be responsible for its maintenance or further enlargement. Types of laryngocele are described according to the position in which the sac develops. When contained entirely within the limits of the larynx it is termed an internal laryngocele; but when extension occurs beyond the larynx as well, it becomes an external laryngocele.

Laryngocele is seen within the larynx as a cystic swelling arising at the anterior end of a false cord, at times merely widening the false cord and causing a funnel-shaped gaping of the ventricle, at times forming a large globular swelling which may fill the whole of one side of the ventricle, and extend across to hide the other cord. In some cases the cyst only enlarges on forced phonation, but in others it remains as a tense tumor obstructing respiration.

Externally, a tumor may be present lying mainly anterior to the sternomastoid muscle and varying in size from a barely palpable nodule to a swelling reaching down as far as the clavicle, or into the submaxillary region, or even displacing the base of the tongue. The character of the tumor may vary like the internal cyst from permanent and almost stony hardness to a fluctuant and reducible hernia-like swelling. The patient may be able to distend the tumor voluntarily by forced expiration.

Laryngocele may first appear at any age. Symptoms vary according to the size of the internal cyst. Alteration of voice is common; it may be only the presence of a peculiar timbre, or, an excessive depth of voice, hoarseness, or weakening almost to aphonia. Difficulty of respiration may be marked, and death may occur from respiratory obstruction. Pain is not a prominent symptom. Radiographic examination can be used in the diagnosis of laryngocele.

NOAH D. FABRICANT, M.D.

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS; CRANIAL NERVES

Alpers, B. J.: Abscess of the Brain: Relation of the Histological to the Clinical Features. *Arch. Otolaryngol.*, 1939, 29: 199.

This report attempts to elucidate the relationship of the time element, the type of bacteria, and the resistance of a patient with a brain abscess to the matter of properly timed surgical intervention. Alpers has studied 26 cases histologically and has presented the views of many contemporary authors on the subject of the histological characteristics of brain abscess.

The author believes that an abscess of the brain consists of 4 layers: (1) the necrotic zone, or abscess cavity, with a variety of tissue and leucocytic débris; (2) the reactive zone, consisting of a layer of loose connective tissue in which lie many fibrin vessels, glitter cells, polymorphonuclear leucocytes, and other types of cells; (3) the fibrous zone, composed of a dense fibrous tissue with but few vessels in it; and (4) the encephalitic zone, where there are found swollen ganglion and glial cell bodies, a perivascular cell reaction, and a meningeal infiltration.

The time or rate of capsule formation depends upon the nature of the invading organism; to some extent, it depends upon the resistance of the host. It is very difficult in most cases to judge when a capsule may have formed, and the optimum time for capsule formation is variable within wide limits, most often, perhaps, three or four weeks. In general, the older the abscess the greater the likelihood of encapsulation, but as an abscess grows older the capsule need not necessarily grow heavier. Traumatic abscesses show the best capsule formation. Alpers found that the staphylococci far outnumbered the streptococci, and it seems agreed that the more virulent the organism, and the more fulminating the original source of infection, the less likely it is that one may accurately judge the time of capsule formation. Anaerobic bacteria do not favor the formation of a capsule, while aerobic bacteria, especially the cocci, favor capsulation.

The capsule of an abscess is composed entirely of elements of connective tissue, and the "participation of neuroglia in the formation of the capsule is either insignificant or totally lacking." This fibrous capsule takes origin from the many fine blood vessels, lymphocytes, and, in cases of trauma, from the dura and pia mater.

In summary, the author finds that it is always safe to postpone operation as long as it seems clinically possible, to make more sure that encapsulation has taken place. Meanwhile, he advises that the sinuses, ear, mastoid, or any other source of infection be looked after. He recognizes the fact, however, that the surgeon's hand may be forced by the extreme state of the patient, and operation may be imperative when actually a localized encephalitis rather than a walled-off abscess is expected to be present. Such cases have been known to have successful termination. The so-called "sterile" abscess of the brain is practically a nonentity.

JOHN MARTIN, M.D.

Davolio Marani, B.: A Contribution to the Recognition of Metastatic Cerebral Carcinoma (Contributo alla conoscenza della carcinosi cerebrale metastatica). *Riforma med.*, 1939, 55: 43.

Marani has attempted to show what may be the typical course of events in a patient with a pulmonary lesion, primary or secondary, of a suspected but unproved malignant nature. He presents a long and detailed history of a patient running the usual gamut of symptoms: fever, pleural effusion, emaciation, development of cerebral symptoms, and eventual death due apparently to the cerebral involvement. His patient demonstrated no motor or sensory losses. There was a high grade bilateral papilledema. Roentgenograms of the skull gave no significant clues. Progressive blindness was relieved temporarily by lumbar punctures. There was moderate rigidity of the neck.

At autopsy an advanced carcinoma of the lung was found. In keeping with the lack of localizing cerebral symptoms, serial sections of the brain were necessary to reveal the widely scattered, multiple, small and microscopic-sized metastatic nodules. There were no large masses. Though meningeal symptoms were few, there was a marked, chronic, metastatic, hyperplastic reaction of all the intracranial meninges.

The article contains a good bibliography and a brief review of the pertinent literature over the past few years.

JOHN MARTIN, M.D.

SYMPATHETIC NERVES

Leger, L.: Denervation of the Carotid Sinus (L'énervation sinu-carotidienne). *J. de chir.*, 1939, 53: 176.

Lauwers reported in 1931 an interruption of fibers connecting the carotid sinus with the neuraxis in 17 patients suffering from epilepsy. The technique of the excision of the carotid body has been confused with that of the denervation of the carotid sinus. The intraparietal terminal branches of the nerve of the carotid sinus respond to mechanical stimuli but their sensitiveness to a chemical irritation depends on the carotid glomus which plays the rôle of a receptor. In early stages of the surgery of this region great attention was paid to the preservation of the integrity of Hering's nerve, but recent investigations proved the harmlessness of the denervation of the sinus even if the operation is performed on both sides. In 1933 Lauwers modified his technique and

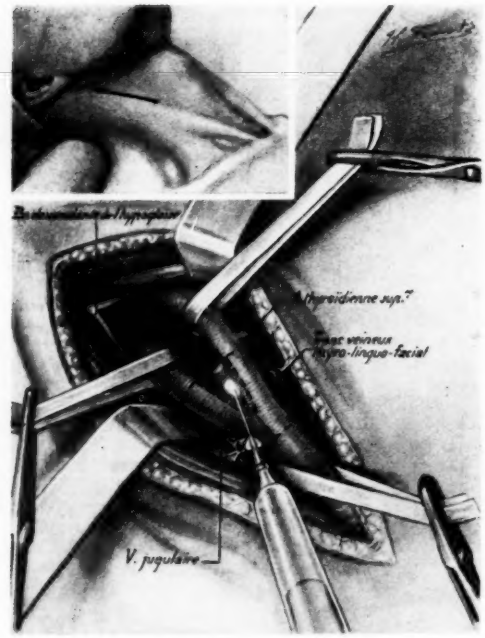

Fig. 1. The carotid crutch is exposed and ribbons placed around the blood vessels. Infiltration of the intercarotid space.

began to combine the enucleation of the carotid body with the section of its nerve after preliminary ligation of the external carotid artery below the superior thyroid artery.

In order to interrupt the depressor reflex the author prefers a sectioning of the terminal branches of the nerves in the carotid angle to the cutting of the Hering's carotid nerve at a distance, above or below the anastomotic loop described by Cordier, because frequent variations of the course of the nerve fibers can make the results of the last mentioned procedure illusory.

The operation is performed with the patient in a semi-sitting position, with a pillow under his shoulders. In view of the reflexes originating in the carotid sinus the choice of the anesthetic is a matter of grave concern. While chloroform should not be used because it intensifies the cardio-inhibiting reflexes, ether may be employed because it diminishes these reflexes; morphine intensifies them and therefore should be combined with atropine. Usually the author prefers the local anesthesia. No matter which type of narcosis is used, the pericarotid adventitia and the tissues in the crutch between the carotid arteries should be infiltrated with a novocaine solution without an addition of adrenalin because this precaution prevents syncope. Furthermore, the infiltration of the pericarotid sheath facilitates the ablation of the peripheral cover of the artery.

The incision is made along the anterior border of the sternocleidomastoid muscle. The dissection of the carotid body and the adventitia of the crutch is carried from the front all around the blood vessels. The accompanying illustrations explain the technique. A bilateral intervention in one stage is possible but the author prefers to perform the sympathectomy first on one side and later on the other. The hemorrhage which follows the section of the artery of the glomus is the best proof that the carotid body has been removed, but the author prefers to ligate this artery before the removal of the carotid sinus. If a compression of the involved region with a finger still produces changes in the blood pressure and the cardiac rhythm, the neurectomy of the carotid sinus is not complete. Slight hypertension following the operation proves its success. On the other hand, local vasoconstriction, which follows sympathectomy in other regions of the body, is a less dependable sign.

The procedure is harmless provided that the carotid crutch has been infiltrated with novocaine before the section. Advanced age is a contraindication to the procedure in view of the fragility of the cerebral arteries; it is prudent in such cases to preserve the regulating apparatus which the carotid sinus represents. Furthermore, the slight hypertension following the operation is undesirable in old individuals. For the same reason, the author considers hypertension as a contraindication to the operation. The field of usefulness of the procedure embraces epilepsy and the syndrome of hyperirritability of the carotid sinus. Hyperemia following denervation of the carotid sinus counteracts the vasoconstriction, which is considered by many authors as responsible for the convulsive crises. Therefore, the denervation may be supplemented by ligation of the external carotid artery. Furthermore, an excitation of the carotid sinus produces generalized convulsions and, finally, epilepsy has been related to a deficiency in calcium while a denervation of the carotid body is sometimes followed by a reactivation of the parathyroid glands. Such is the theoretical basis for the denervation of the carotid body in epilepsy. Of 80 cases collected from the literature 15 resulted in complete recovery and 21 presented amelioration of the condition.

The syndrome of hyperirritability of the carotid sinus is most frequently produced by a slight trauma in this region, such as a narrow collar, pressure of the razor, or a simple hyperextension of the neck. The syndrome consists of an extreme pallor, loss of consciousness with or without convulsions, and slowing of the cardiac rate; three types occur:

1. The vagal type in which the vertigo is caused by a sino-auricular or auriculoventricular block with a resulting acute cerebral anemia. An intravenous injection of atropine stops the attack; adrenalin has the same effect.

Fig. 2.

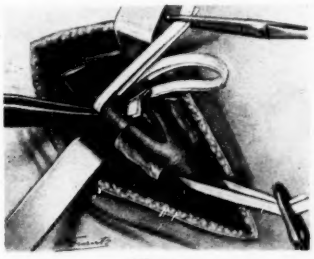

Fig. 3.

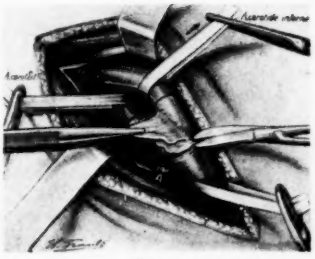

Fig. 4.

Fig. 2. Start of the perisinusoidal sympathectomy. Fig. 3. Ribbon around the internal carotid is pulled so as to facilitate the posterior dissection. Fig. 4. Finishing of the posterior dissection.

2. The depressor type in which a general vasodilatation causes a fall of the arterial pressure of extracardiac origin. The manifestations yield to adrenalin but are not influenced by atropine.

3. The cerebral type in which the convulsions and unconsciousness seem to be due to a reflex action on the hypothalamic region. In such cases both atropin and adrenalin are inefficient. The vagal type requires an operation only if the medical treatment with belladonna or ephedrine proves to be unsuccessful. The depressor type may be treated with adrenalin or ephedrine, and an operation is indicated only in the presence of a complete failure of the conservative therapy. The cerebral type can be successfully treated only by an operation. In 12 of 14 cases collected from the literature the denervation of the carotid sinus produced cure.

JOSEPH K. NARAT, M.D.

SURGERY OF THE THORAX

CHEST WALL AND BREAST

Andrews, J. R.: The Technique of X-Ray Treatment of Operable Cancer of the Breast Based Upon an Analysis of Keynes' Radium Technique. *Radiology*, 1939, 32: 294.

It has been shown by Keynes that survival rates equivalent to those obtainable by radical surgical methods can be obtained by radiological methods in the treatment of primary, operable cancer of the breast. This applies, however, only to interstitial radiation and not to external radiation techniques.

There are, at present, no criteria based upon statistical survival data upon which to base a concept of adequate dosage in the external irradiation treatment of operable carcinoma of the breast. Keynes' data, based upon the interstitial irradiation of breast cancer, provide such a criterion on the assumption that a direct comparison in terms of the roentgen can be made. An analysis of Keynes' technique for the irradiation of the breast and axilla, in terms of the roentgen, was made by the author. The minimum dose in the breast was found to be 3,000 roentgens and that in the axilla from 1,200 to 3,000 roentgens. The doses of x-ray necessary to deliver comparable minimal doses to the breast and axilla were found to be at least 3,000 roentgens through each of two lateral breast ports and about 6,000 roentgens through a single port in the axilla. Such radiation, to be comparable, should be delivered within twenty days.

A case illustrating this technique is presented. The reaction resulting from such treatment is so severe that the method should be employed in the treatment of operable breast cancer only if there are the strongest contraindications to a radical mastectomy. The technique can, however, be modified so as to be suitable for any inoperable or recurrent breast-cancer problem.

If, however, radical mastectomy is not possible and x-ray radiation is employed as the treatment of choice, no radiation technique should be considered adequate which does not deliver, in a short time, a minimum dose of 3,000 roentgens to any point in the breast and axilla. JOSEPH K. NARAT, M.D.

TRACHEA, LUNGS, AND PLEURA

Nissen, R.: A Critical Review of Extrapleural Pneumothorax. *Brit. M. J.*, 1939, 1: 100.

This author states that a stand should be taken against the present tendency to extend the indications for the use of extrapleural pneumothorax. The operation is an adventure into the unknown.

Extrapleural pneumothorax is an easy operation for both doctor and patient. This statement must be qualified by pointing out that a variety of complications are possible. The "optimistic" literature at present available is based on but brief experience. Having had nine years' experience, the author believes that much greater caution should be urged. This was approximately the conclusion which he reached in his first publication in 1931, and after many digressions he has returned to it.

Thoracoplasty, its various modifications, and plombage are superior to extrapleural pneumothorax. When it is possible to apply them, extrapleural pneumothorax should not be considered. It should be considered only when pneumothorax fails as a result of widespread adhesions, when the extent of these does not allow of plombage, or when the general condition or the state of the other lung does not permit of a thoracoplasty. Within these narrow limits extrapleural pneumothorax is the only possible method of collapse therapy. It may be employed even though one cannot expect much from it, and the rare permanent results gain in value when one considers the hopeless fate of the patients for whom this form of therapy is recommended.

There is a doubtful indication for extrapleural pneumothorax in the case of recent cavities with delicate pleural adhesions when a thoracoplasty seems unsuitable on account of the risk of mediastinal flutter, and a plombe because of the likelihood of its slipping down. These cases are relatively rare. The author now performs extrapleural pneumothorax in cases of this type only when he can assume a sufficient degree of pleural thickening. Then he replaces it by thoracoplasty (apical thoracoplasty). Extrapleural pneumothorax in such a case plays the part of a preparation for rib resection.

J. DANIEL WILLEMS, M.D.

Jeanneret, R., and Keser, V.: Note on the Operability of Apicomediastinal Adhesions and Their Rôle in the Failure of Pneumothorax (Note sur l'opérabilité des adhérences apico-médiastinales et sur leur rôle dans l'inefficacité du pneumothorax). *Arch. méd.-chir. de l'appar. respir.*, 1938, 13: 264.

Jeanneret and Keser state that in 55 of 300 cases in which artificial pneumothorax was done at the Mont Blanc Sanatorium, there were no adhesions present, or the adhesions were sectioned before the pneumothorax was instituted. In 49 of these cases, or 81 per cent, the results of the pneumothorax were excellent, good, or satisfactory; the pneumothorax was unsuccessful in only 6 cases (11 per cent). It is noted that there were only 20 cases entirely free from adhesions, less than 7 per cent, which is a low percentage in comparison with cases reported elsewhere.

In 190 cases there were adhesions to the external thoracic wall; they were either apical or lateral, posterior or anterior, and of various types—narrow bands or extensive fusion. In this group the artificial pneumothorax gave satisfactory results in only

85 cases or approximately 45 per cent. In 105 cases (55 per cent) the results were unsatisfactory. Later, section of the adhesions in some cases resulted in satisfactory improvement. While in 45 per cent of this group the collapse of the lung obtained was sufficient to render the sputum free from bacilli, the ultimate prognosis in these cases does not appear to be favorable, and a more extensive use of the pleuroscope would seem to be indicated.

In 55 cases apicomediastinal adhesions were present. The pneumothorax gave satisfactory results in 43, or approximately 78 per cent of these cases and unsatisfactory results in 12, or 22 per cent. Artificial pneumothorax is, therefore, much more likely to give satisfactory results when apicomediastinal adhesions are present than when there are adhesions to the thoracic wall. The results are not so favorable, however, as when no adhesions are present or adhesions are sectioned before the pneumothorax is instituted. It seems desirable to section such adhesions; a precise localization of these adhesions and their points of attachment with the use of the pleuroscope and a careful technique make it possible to do this successfully in many cases. Membranous or cord-like adhesions, even when their points of insertion are in the zones considered dangerous, can be operated on with the use of specially shaped cauteries. An extensive fusion between the apex and the mediastinum is, however, inoperable. The use of the pleuroscope is necessary to determine whether adhesions or extensive fusion is present, and for the exact localization of the adhesions. If the pneumothorax is unsuccessful and the pulmonary cavity persists after several weeks, pleuroscopic examination is indicated. If adhesions are found they should be sectioned so as to liberate the lung to the hilus; if a true fusion is found, some surgical procedure other than pneumothorax is indicated.

ALICE M. MEYERS.

O'Shaughnessy, L., and Mason, G.: Thoracolysis: A Conservative and Selective Operation for Certain Cases of Pulmonary Tuberculosis. *Brit. M. J.*, 1939, 1: 97.

This article is concerned with that type of tuberculosis in which the disease, usually fibrocavernous, has involved mainly the middle or lower zone of one lung; in which it has been impossible to obtain an adequate collapse by artificial pneumothorax; and in which healing has not followed diaphragmatic paralysis. For this type of case the alternative to the operation to be described was a "total" thoracoplasty with the consequent functional sacrifice of an unduly large area of healthy lung tissue. This was considered an operation of undesirable severity in view of the general condition of the patients.

Healing was started by carefully designed selective resections of relatively small portions of the ribs in the vicinity of the lesions; that is, just where relaxation of scar tissue in the underlying lung was required. Thoracolysis was the term applied to the procedure under discussion, as it consists essentially of making the chest wall more yielding in some desired situation, and so permits retraction of any scar tissue in the underlying lung.

The portions of ribs which it is usually necessary to remove in this operation are easily accessible through direction incisions, and tissue trauma is reduced to a minimum as little retraction is necessary. Consequently, the operation is one which can be employed for patients in relatively poor physical condition. It is a comparatively easy operation to carry out under local anesthesia, should this be desirable. Comparative freedom from marked post-operative disturbances characterizes the cases in this series. If there is clinical and radiological evidence that the operation has favorably influenced the lesion but has not healed it by the time the ribs have regenerated, the operation may be repeated.

The author cites 8 cases in great detail to support his contention. J. DANIEL WILLEMS, M.D.

Myers, D. W., and Blades, B.: The Clinical and Roentgenological Features of Pulmonary Abscess Located in the Superior Division of the Lower Lobes. *J. Thoracic Surg.*, 1939, 8: 321.

Putrid pulmonary abscesses have a predilection for the right lower lobe of the lung. This is not only known to many observers, but is also brought out in a review of the cases of abscess of the lung at the Barnes Hospital during a period of three years. Sixty-two cases of non-tuberculous pulmonary abscess were studied. Of these 38 occurred in the lower lobe of the lung, 27 in the right lung and 11 in the left lung. Of all of these, 18 occurred in the superior, and 20 in the inferior, division of the lower lobe.

Although the physical examination is notoriously unreliable, definite findings were present in the majority of these cases in which the process was localized in the superior division of the lower lobe. The signs noted were over the posterior aspect of the thorax in the area situated between the spine and the posterior axillary line, between the levels of the fifth and ninth ribs. Impairment of the percussion note was the most valuable of all these physical signs. Auscultation revealed frank evidences of consolidation. Râles were almost invariably noted, but they were often widely transmitted and were regarded as an unreliable localizing sign.

Bronchoscopic examination provided valuable information, and permitted the determination of the source of the purulent secretion.

Roentgen examination in the postero-anterior projection frequently left the false impression that esions involving the apex of the lower lobe were situated near the hilum of the lung. Roentgenograms in the lateral view cleared this up and showed the true situation of the lesions.

Body-section roentgenography with the aid of the laminagraph frequently was successful in revealing a hidden abscess, and thus this method constituted an important diagnostic advance. It is of great assistance in determining the relationship of the lesion to the chest wall.

Lipiodol bronchograms have often given additional information which was not provided by roentgenograms. The lesion usually was mapped out by a process of exclusion, the area which the contrast medium had not entered representing the site of the abscess. J. DANIEL WILLEMS, M.D.

Tod, M. C.: Tumors of the Lung, Mediastinum, and Pleura. *Edinburgh M. J.*, 1939, 46: 95.

Two hundred and sixty cases of intrathoracic malignant tumors were collected and studied in relation to (1) the pathological nature of the tumor, and (2) radiation therapy. Of these, 104 were bronchial carcinomas, 140 were tumors arising in lymphoid tissue (Hodgkin's lymphadenoma and lymphosarcoma), and the others were rare mediastinal and pleural tumors, such as sarcoma, endothelioma, and neurocytoma.

The author believes that all primary carcinomas of the lung are of bronchogenic origin, and that they apparently arise from small stem cells which lie adjacent to the basement membrane. Carcinomas of the lung are classified as follows: (a) carcinoma with squamous character, (b) carcinoma with glandular character, (c) undifferentiated carcinoma, and (d) mixed types.

In the series of 104 cases, 25 per cent of the tumors were squamous, 20 per cent were glandular, and 55 per cent were undifferentiated. As to the pathology of mediastinal tumors, Hodgkin's lymphadenoma is regarded as a true neoplasm, and this tumor, together with the lymphosarcomas, is thought to originate from the primitive mesenchymal cells found in lymphoid tissue. Two primary tumors of the thymus are presented and discussed, as are teratomas of the mediastinum and tumors of neurogenic origin arising in the mediastinum. A single case of endothelioma of the pleura is recorded. The author believes that endotheliomas of the pleura exist, in spite of certain quoted opinions to the contrary.

External irradiation with x-rays is, as a rule, the only treatment which can be considered for this group of tumors. The conception of treatment is based on three factors, viz., the radiosensitivity, the minimum lethal dose, and the time factor. It is suggested that the minimum lethal dose is that dose which will lead to the destruction of all stem cells in the tumor. The stem cells of the lymphoid tumors are considered to be more radiosensitive than those of epithelial tumors; hence a dose of not less than 6,000 roentgens in six weeks should be used in bronchial cancer, while a minimum dose of from 2,500 to 4,000 roentgens in five or six weeks should be used for primary neoplasms of the lymph nodes. For rare malignant tumors, the author advises a dose of 6,000 roentgens in six weeks.

The prognosis under x-ray therapy is unsatisfactory. One patient with bronchial cancer was alive and symptom-free one year following treatment; the others died in from twelve to eighteen months after treatment. However, palliative treatment with smaller doses results in the alleviation of distressing symptoms and should be attempted even though distant metastases are present. On the other hand, palliative treatments should be discontinued if reactions are encountered which increase the patient's discomfort. LUTHER H. WOLFF, M.D

D'Almeida, N.: Cancer of the Lung. Anatomico-clinical Study (Cancro do pulmão. Estudo anátomo-clínico). *Arq. de patol.*, 1938, 10: 221.

The statistics published during the period from 1850 to 1924 would indicate that the frequency of cancer of the lung is steadily increasing. The etiological factors may be divided into chemical, physical, and pathological. To the first group belong tobacco, gases used in warfare or industries, and gases produced by explosions in motor cylinders. The second group includes foreign bodies in the bronchi and traumas of the chest. Tuberculosis, influenza, syphilis, pneumonoconiosis, various avitaminoses, and congenital defects comprise the third group. The analysis of each group shows that each factor may be a determining or adjuvant cause in the genesis of the cancer. Generally speaking, all factors causing a local irritation play an adjuvant rôle.

Of the three forms of pulmonary cancer, viz., diffuse-infiltrating, bronchiogenic, and lobar, the last-mentioned type is the least malignant. The symptoms of the cancer in this location are not characteristic. In 1 patient axillary and cervical metastases without pulmonary symptoms were found. In several cases the diagnosis has been made by examination of histologically expectorated fragments of the tumor. Lobectomy or pneumonectomy is recommended by the author whenever there is a probability of success. If this is not the case, an intratumoral introduction of radon needles according to Tudor Edwards' technique is suggested. X-ray treatments have only a palliative effect.

The male sex is more frequently affected than the female, and the majority of cases occur between the ages of fifty and sixty years. Arsenic, nickel, and antimony have the greatest carcinogenic effect. Tar vapors and radio-active emanations are also dangerous. Bronchoscopy and roentgenograms after injections of a contrast medium are valuable diagnostic aids.

Of 16 patients treated with x-rays, only 1 recovered and the diagnosis was doubtful in this case. Only an early operation promises a cure.

JOSEPH K. NARAT, M.D.

Lumsden, C. E.: Pulmonary Carcinoma: A Pathological Study of a Series of Cases, with Special Reference to the Route of Spread and to the Factors That Determine the Mode of Spread. *Glasgow M. J.*, 1939, 131: 57.

In the present series of 43 cases of primary intrathoracic malignant disease, 36 were determined as being "bronchial carcinomas," and 4 were recorded as "pleural endotheliomas." Of the remaining 3, 1 "mediastinal squamous epithelioma" was of unde-

termined or unspecified origin and the 2 other cases were associated with the esophagus. Only the 36 cases of "bronchial carcinoma" and the 4 so-called "endotheliomas of the pleura" are considered in the discussion.

Of the bronchial carcinomas, 27 occurred in males and 9 in females. The average age incidence of the group was forty-seven and six-tenths years, the youngest patient in the series being twenty-nine, while the eldest was sixty-eight. In 24 of the 36 cases the neoplasm was in the left lung and in the 12 other cases it was in the right; the upper lobe was involved in 31, the ower in 19, the middle right in 8, and more than one lobe in 17.

In 26 of the 36 cases the neoplasm was described as "large," in 24 "nodular," and in 14 "diffuse." In 35 cases there was extensive adhesion of the associated parietal and visceral pleuræ, while in 11 cases there was a considerable amount of fluid in the associated pleural cavity (blood-stained in 4), and in 7 there was a similarly large amount in the pleural cavity of the non-involved side.

There was a generalized invasion of the mediastinum by neoplastic growth in 18 cases, and in 32 the associated tracheobronchial lymph nodes were enlarged and apparently involved by the cancerous process.

Necrosis within the neoplasm had occurred in 24 of the cases. In 4 cases there had occurred large intrabronchial hemorrhage, but this was found to have been the immediate cause of death in only 2 patients.

In the majority, or 29, of the cases studied, a close anatomical relationship of the neoplasm to the wall of the trachea or bronchus was demonstrated; the criterion of this was ulceration of the bronchial wall and obliteration, partial or complete, of its lumen. The primary focus of the tumor was found to be between 1 and 4 cm. from the bifurcation of the trachea in 20 cases, and at the bifurcation of the trachea itself in 6 cases. In 4 cases the appearances warranted the opinion that the tumor had started in one of the main branches of the primary bronchus, and in only 1 case was it demonstrated satisfactorily that the growth had developed primarily in relation to a bronchiole. In no case was there any indication that the carcinoma had arisen from more than a single focus.

"Metaplasia" of the bronchial epithelium was demonstrable microscopically in sections taken from 9 of the cases; the epithelium in question varied from a single layer of "basal" cells, through the cuboidal and simple squamous type to, in 1 case, true stratified squamous epithelium.

Prominent among the associated pulmonary conditions present in these cases of bronchial carcinoma were: suppuration in 24, partial collapse of the lung in 12, bronchiectasis in 12, pulmonary fibrosis in 11, pulmonary edema in 9, extensive cavitation in 8, widespread fibrinous pneumonic changes in 8, emphysema in 4, empyema in 1, and tuberculosis in 1. No example of infarction occurred.

In 4 of the 36 cases, metastases, either regional or distant, were absent or were not recorded, but in 31 of the cases definite metastases were found in the regional lymphatic nodes. Metastases to distant structures or organs were described in 17 cases; they were single in 3, and multiple in 14. Macroscopic metastases were recorded as follows:

	No. of Cases
Regional lymphatic nodes	31
Liver	9
Abdominal lymphatic nodes	8
Opposite lung	5
Skeletal system (vertebræ 3; ribs 1)	4
Kidneys	3
Brain (cerebrum 2; cerebellum 1)	3
Pancreas	2
Diaphragm	1
Spleen	1
Adrenal gland (left)	1

In 5 cases there was actual invasion of the posterior parietal pericardium; in 3 there had been pressure on the superior vena cava leading to edema of the upper extremities; the arch or the descending thoracic aorta was completely surrounded by firm growth in 2 cases; and in 1, pressure by involved lymphatic glands had caused paralysis of the recurrent laryngeal nerve.

The tumor mass was invariably related to the main bronchus or to one of its branches; it was usually of an annular type; it invariably extended along the wall of the air-passage involved, either in a central or a peripheral direction, and while it usually extended also radially in relation to the center of the bronchus, it did so fairly evenly, and the spread in this direction was never so extensive as that longitudinally to the axis of the bronchus.

Stenosis of the bronchial lumen was rarely complete and was usually a late complication; when it occurred it was most frequently due to fungation of the tumor tissue which had come from outside of the cartilaginous plates and had penetrated between these into the submucosal tissue. It appears that bronchial carcinoma, although arising from "bronchial epithelium," does not proliferate into the lumen of the bronchus in the initial stages as frequently as might be expected.

Cases seen at autopsy always exhibited two other characteristics: first, a marked neoplastic invasion of the fibrous supporting tissue around the structures in the pulmonary hilum with the almost invariable involvement of the hilar lymphatic nodes; and, second, a marked thickening of the peribronchial, perivascular, interlobular, and interlobar fibrous connective tissue. The thickening in the second group of instances was due to neoplastic invasion with or without accompanying fibrosis, but occasionally fibrosis alone was present and neoplastic extension was not demonstrated microscopically in this thickened fibrous tissue.

Discrete satellite nodules were sometimes seen in the lung substance peripheral to the main, and presumably oldest, mass of the tumor, but these were

always smaller than the parent mass. In the case of lung carcinoma, at least, the growth of neoplasm conforms to the general biological experience that the size of a growth is a moderately good indication of its relative age. Perhaps it is the latter assumption that accounts largely for the diagnosis, when it is made, of "pleural endothelioma," in which the large mass of the tumor, diffusely spread through the pleura, contrasts so markedly with the smallness or absence of any tumor tissue in the lung substance away from the pleura. That the histology alone cannot determine whether a malignant growth in the pleura is primarily of that structure has been repeatedly emphasized.

Microscopical examination of the fibrous connective tissue in any of the sites mentioned above has rarely failed to demonstrate numerous instances of neoplastic cells growing actively in and along the lymphatic spaces and lymphatic vessels.

There are two main divisions of the lymphatic structures of the lungs: one set in the pleura and the other in the pulmonary tissue. They both drain into the lymph nodes at the hilum. In the lung parenchyma the lymphatic system consists of lymph vessels in relation to the air passages and the blood vessels; there are no lymphatic vessels beyond the alveolar ducts. The lymph drainage from the alveolar walls into these lymphatic vessels occurs by way of the tissue spaces; comparative studies lead to the possibly significant conclusion, however, that this must be small both in health and in disease. All the lymph vessels of the pulmonary tissue drain toward the hilar nodes and are valveless.

Lymphatic communications between pleural and superficial pulmonary plexuses are relatively few and the communicating vessels that are present are guarded by valves pointing toward the pleura, which provide a mechanism whereby lymph can flow from the pulmonary tissue into the pleural lymphatics if the normal flow of lymph in the former toward the hilum is interrupted.

From the hilar lymphatic nodes invasion by the neoplastic cells can occur rapidly into the mediastinum. There is free communication between the lymphatic structures of the mediastinum, the parietes, the retroperitoneal tissues, and the deep structures of the neck.

In the type of growth discussed massive necrosis is common, and it might well be that, through the act of respiration, small particles of the tumor become detached from the mass and are inspired into deeper parts of the bronchial tree, there to set up secondary growths. No evidence, however, has been found that such dissemination occurs.

The neoplastic cells also may grow along the inner walls of the small bronchi and of the alveoli. This can usually be demonstrated in serial sections taken near the periphery of the growth, but this is a slow mode of spread and plays only a subsidiary part in the dissemination of the carcinoma.

Regarding the 4 cases of "endothelioma" of the pleura, the criteria upon which the diagnosis had been made were (1) the apparent localization of the neoplasm to the pleural structures, and (2) the histological type of cell present in the tumor.

In 2 of the cases, subsequent microscopical examination showed the presence of neoplastic tissue in relation to one of the branches of the bronchi in the lung, but in the other 2 no evidence of an intrapulmonary neoplasm was found.

In every case the cells were of a flattened, squamous, or cuboidal type. Spread had occurred extensively along lymphatic vessels.

Three possible routes are available for the spread of the tumor in the lung tissue: first, by way of the tissue spaces and lymphatic channels; second, by way of the blood vessels; and third, by way of the epithelial surfaces. In the pleural cavity, dissemination may occur by transplantation.

With the very rare exception of round-cell sarcomas of the mediastinum arising either in relation to thymic tissue or to lymph nodes, the majority of primary intrathoracic malignant neoplasms are carcinomas originating in a focus related to the lining of the bronchial tree.

The neoplasm grows out along the lines of least resistance. Following the tissue spaces, it soon comes into contact with blood and lymph capillaries. The blood capillaries must either resist invasion by the neoplastic cells or else be occluded by the neoplastic process, since evidences of intracapillary growth and embolism are not seen in the histological picture. The lymphatic capillaries, however, form a frequent route of spread of the neoplasm, and as the latter grows, more and more lymphatic channels are invaded and the neoplastic cells eventually reach the associated bronchial lymph node; here, a metastatic focus is formed. The neoplastic cells are carried along as emboli or they permeate by continuous growth along the walls of lymphatic channels; it may be that the latter is the essential manner of lymphatic metastasis.

The relative infrequency of spread by the arterioles and venules in contrast to that by the corresponding lymphatic channels may be due to structural differences in the walls; the walls of the former consist of well developed structures, whereas those of the latter are little more than a layer, possibly incomplete, of endothelial cells. A neoplasm in its growth, therefore, can erupt into the lumen of a lymphatic channel more easily than into the corresponding blood channel. The flow of blood is relatively rapid also, whereas that of the lymph is more of the nature of a percolation. Should a single neoplastic cell reach the lumen of the blood vessel it is likely to be washed away and dealt with by the natural mechanism whereby effete cells in the blood are destroyed. Such movement of the lymph as occurs in the lymphatic vessels not only is slower but is of a to-and-fro nature; moreover, again in contrast to the blood flow, when a lymphatic vessel of even moderate size is occluded, the lymph drainage readily occurs in the opposite direction to that which it formerly took and the fluid is thus carried

away along neighboring channels. Thus, even the single cell reaching the lumen of the lymph vessel and blocking it will be more likely to remain there and be thus enabled to reproduce, forming a continuous chain of neoplastic cells along the lymphatic lumen or a smaller or larger mass of neoplastic growth.

The evidence of spread of carcinoma by the blood stream is the occurrence of secondary metastatic foci in organs which, like the brain, have no lymph drainage system communicating with the general lymphatic system of the body. Such generalized spread by the blood stream is common.

What part, if any, respiratory movement plays in the spreading of pulmonary carcinoma has not been determined, but the examination of sections leaves no doubt that spread occurs from one alveolus to another by the continuous growth of neoplastic cells along the wall of these spaces.

Invasion of the respiratory units probably occurs by the eruption of the neoplastic cells from the terminal portion of a lymphatic vessel into the atrium. Having spread along the surface of the alveoli of the respiratory unit, the advancing neoplasm reaches the alveolar duct; the cells then pass into the lymphatic vessels which are associated with this part of the respiratory apparatus and along which the neoplasm has not yet extended. Thence further extension is by the lymphatic vessels.

SAMUEL KAHN, M.D.

Sergent, É., and Kourilsky, R.: Pleural Endothelioma; a Radiological and Pleuroscopic Picture (Contribution à l'étude de l'endothéliome pleural; image radiologique et pleuroscopique). *Presse méd.*, Par., 1939, 47: 257.

Pleural endothelioma is not very common. Most cases have been discovered at autopsy following anatomical and histological examination or during life from cytological findings in the pleural puncture fluid. The latter are often difficult of interpretation, and the roentgenographic picture of the condition is not well known. For this reason the authors feel justified in reporting a case in which diagnosis was established during life by exploratory pleuroscopy, the roentgen picture showing a series of rounded pseudocystic shadows of peculiar aspect. The patient was a man sixty-two years of age who had for twenty years been subject to attacks of paroxysmal cough lasting for about ten minutes and occurring in the morning on awakening or at night. The cause had not been discovered. In October, 1931, after a violent attack of cough, he mechanically put his hand to his right chest, and to his great astonishment felt a tumor at the third rib. The tumor was painless but quite large and of oblong shape. Since this date the patient complained of slight dyspnea. An examining physician suggested that the condition might be syphilitic osteitis and prescribed two series of quinby which had no effect. A roentgen examination made in October, 1931, proved negative. In January, 1932, a pleural effusion was found and puncture yielded 350 c.cm. of serofibrinous fluid. The effusion reformed very rapidly, and three weeks after the first puncture, another puncture yielded 2,500 c.cm. of fluid and led to an attack of acute pulmonary edema. The further punctures were then spaced more carefully at shorter intervals and yielded about 1,500 c.cm. every ten days. A diagnosis of pleural tumor was then established and deep roentgenotherapy administered, about eight sittings in one month, the dosage being unknown. After hospitalization another series of irradiations was administered totalling 3,000 roentgens. This time the fluid did not reform so rapidly and punctures could be made monthly.

Re-examination in June, 1932, showed that the pleural tumor involved the right sternocostal region and it was believed to be of myeloplax nature. Operation was advised. The endothelial cells in the puncture fluid were of a peculiar type. Many had several nuclei and many were united into plasmodia. Hesitating with regard to operation, the patient was given a course of autoserotherapy but without appreciable result. The fluid reformed with progressive speed and in September, 1932, punctures had to be made every ten days. There was no fever and the general condition of the patient remained good. A collateral circulation had developed about the tumor, which was hard and painful to palpation. During an attack of cough the tumor increased in size and became painful. It could not be reduced by prolonged pressure, however. Percussion revealed uniform dullness over the entire right half of the thorax but most marked in the lower half over the tumor. The heart was displaced slightly to the left. Roentgenological examination revealed a diffuse shadow over the entire right hemithorax. A fluid level could be demonstrated about half way from top to bottom. Above it appeared an opacity instead of the expected rarefaction. The fluid was movable when the patient changed position. The liver and spleen and the glands in the supraclavicular and axillary regions were normal. It was clear that the patient was suffering from a neoplastic pleurisy but the origin of the tumor was more problematic.

For a long time an osseous origin was suspected, based on previous discussions and the initial diagnosis of osteitis. However, this theory had to be rejected because no bone swelling could be demonstrated. As for a mediastinal origin, the roentgenological examination with oblique exposure showed that the median rarefaction was definitely above the fluid. Moreover, no marked mediastinal compression, nervous or bronchial, could be noted in spite of the long duration of the disease. There was partial venous compression but this could not be attributed to the systems of the superior vena cava or the brachiocephalic trunk. The swelling was likewise definitely subclavicular, superficial, and without connection with the mediastinum. These findings thus eliminated the theory of a mediastinal origin. Nor did a pulmonary origin seem probable. The patient had never exhibited parenchymal symptoms

of cancer of the lung. He had no fever, there was no expectoration nor hemoptysis, and there were no signs of pulmonary congestion demonstrable in the roentgenogram.

From the clinical findings alone it was concluded that the origin of this neoplastic pleurisy was exclusively pleural. As the growth was endopleural it was quite natural that the functional symptoms should be limited to an unproductive cough. The peculiar feature in the history of this patient was the attacks of dry cough over a period of from fifteen to twenty years, without laryngitis or pharyngitis, so that it seemed plausible to suspect that there had existed a benign subpleural process remaining latent for a long time and becoming suddenly malignant. The unusual number of endothelial cells in the puncture fluid, the nuclear malformations, and the plasmodial aspects of the fluid all suggested an intrapleural process. Although no metastasis developed, the fluid reformed more and more rapidly and necessitated frequent punctures, and the infiltration of the pleural masses became more and more extensive as demonstrated radiologically. The tumor in the right side of the chest became enormous. The patient died in September, 1933.

Pleuroscopy showed that all of the rounded pseudocystic shadows in the roentgenogram corresponded to endotheliomatous masses resembling strawberries, with such abundant vascularization that biopsy was dispensed with for fear of hemorrhage. In spite of this rich blood supply, the pleural fluid was not bloody and contained only a few erythrocytes. Vital staining of the endothelial cells revealed the unquestionable endotheliomatous nature of the neoplasm. In spite of its endothelial origin and malignancy, the tumor was not radiosensitive.

Sørensen recently reported the finding of 4 such cases in a series of 5,680 autopsies. He likewise emphasized the difficulty of clinical diagnosis. Sarcoma and endotheliosarcoma of the pleura are not associated with pleural effusion. The presence of effusion should suggest endothelioma in aged subjects. Such effusion is not necessarily hemorrhagic, however. If such effusion is recurrent and without parenchymatous symptoms in spite of considerable duration a pleural neoplasm rather than a pulmonary tumor is probable. Roentgenologically the presence of rounded pseudocystic shadows with a free posterior mediastinum is suggestive. Multiple hydatid cysts are not accompanied by abundant or recurrent effusion and are always associated with parenchymatous symptoms and a positive Casoni test. Pleuroscopy will reveal the strawberry-like masses on the interior of the pleural surface.

EDITH SCHANCHE MOORE.

SURGERY OF THE ABDOMEN

GASTRO-INTESTINAL TRACT

Forssell, G.: The Rôle of the Autonomous Movements of the Gastro-Intestinal Mucous Membrane in Digestion. *Am. J. Roentgenol.*, 1939, 41: 145.

With the help of serial photographs the author presents the results of his anatomical investigations concerning the variations in the mucous membrane of the gastro-intestinal tract.

The folds of the mucous membrane adapt themselves continually to the degree of contraction of the muscle wall, but at the same time the mucous-membrane relief adapts itself to the consistency and form of the contents of the digestive canal and to the regulation of the forward passage of these contents.

With maximal contraction of the muscle wall and with an empty lumen, the mucous membrane fills out the muscle tube and forms an "initial relief" with an appearance which is specific for each particular segment of the digestive tract. In places where the digestive canal is very distended the mucous membrane adopts a uniform "final relief." In the stomach, colon, and rectum, except the sphincters, the mucous membrane folds then disappear, while in the small intestine transverse folds persist even in the state of marked distention.

A certain contraction of the muscular tube is necessary for the formation of macroscopic folds in the mucous membrane. After such a contraction the mucous membrane, by alternately producing a smooth surface or folds of various sizes and forms, without altering the diameter of the muscular tube, is able to form a "working relief," the shape of which can vary greatly at the same site.

MANUEL E. LICHTENSTEIN, M.D.

Hesser, S.: On Relapsing Gastric Hemorrhages and Their Treatment. *Acta med. Scand.*, 1939, 98: 340.

There were 512 admissions to the Linköping Hospital in Sweden for acute massive gastric hemorrhage during the past nine years. This material consisted of 406 patients, 284 of whom had been admitted once for hemorrhage, and 122 of whom had had 2 or more hemorrhages, necessitating 228 admissions. Thirty per cent of the 406 patients, therefore, experienced multiple hemorrhages. In these 122 patients the incidence of hemorrhage varied from 2 to 22 times per individual, with a total of 370 hemorrhages.

Among the 122 patients there were 7 deaths, 3 of which may be justifiably deducted because they occurred as follows: 1 in a seventy-four-year-old man with a perforated gastric ulcer, in whom death followed the first hemorrhage; the second in a forty-six-year-old man in whom the hemorrhage was complicated by cirrhosis of the liver and ascites; the third in a patient who had a complicating glomerulonephritis and acute bronchopneumonia. The 4 remaining deaths were in a seventy-four-year-old woman with arteriosclerosis, a forty-one-year-old woman with cystic kidneys, an eighty-four-year-old man with arteriosclerosis and bilateral bronchopneumonia, and a sixty-four-year-old man who died from peritonitis secondary to surgical leakage. All the deaths occurred in individuals more than forty years of age. In an analysis of the prognosis, the uncorrected mortality would therefore be 4 deaths from loss of blood in 122 patients, or 3.3 per cent. However, these 122 patients were hospitalized 228 times for hemorrhage; therefore in 228 hemorrhages there were 4 deaths, or a mortality of 1.07 per cent.

The author's surgical experience is based upon 30 of these 122 patients. A gastro-enterostomy was done 14 times; a Billroth I operation, 7 times; a Billroth II, twice; a Polya resection plus gastro-enterostomy, once; division of the fundus and gastro-enterostomy, twice; invagination of the ulcer, 8 times; excision of the ulcer, twice; and exploratory laparotomy, twice. Surgery exercised apparently little or no effect in the prevention of recurrences of hemorrhage because the 14 patients who had had gastro-enterostomies subsequently had 24 hemorrhages. The 7 patients upon whom the Billroth I operation had been performed had 11 postoperative hemorrhages, and the 5 patients upon whom the Billroth II operation was performed had 29 hemorrhages. This was contrasted to the 96 patients not operated on or who were subjected to only minor surgery, in whom there occurred a total of 306 hemorrhages. Thus on the average, in the operated cases there were 2.5 hemorrhages per patient, and in the non-operated, 3.2. The essayist concludes that it "thus appears indubitable that relapse hemorrhages after the different kinds of gastric operations which are here under consideration are not unusual, and that one may venture to say that a gastric operation is by no means an effective prophylactic measure against relapses. To what extent they have been of benefit, or whether they have been of any value at all, cannot be judged from this material, but the conclusion will be that it is wise not to hope too much."

SAMUEL J. FOGELSON, M.D.

Wangensteen, O. H., and Rea, C. E.: The Distention Factor in Simple Intestinal Obstruction. *Surgery*, 1939, 5: 327.

It has become increasingly apparent that the factor of distention plays a significant rôle in the sequence of events which attends obstruction of the bowel. For many years it was generally believed that absorption of abnormal toxins formed during the course of the obstruction was the important determinant which brought about a lethal issue. The breakdown of this hypothesis began with an under-

standing of the effects of dehydration and dechlorination which accompanied pyloric and duodenal obstruction or fistula. The efficacy of saline solution in prolonging the lives of dogs with duodenal obstruction served to explain the significant lethal factor in high intestinal obstructions fairly well.

The cause of death in experimental ileal obstruction has defied complete understanding. The administration of saline solution fails to prolong life materially, whereas, in obstruction of the pelvic colon in the dog survival continues for a long period of time without the administration of saline solution. It has been the authors' belief that the inability of the patient to empty the lower reaches of the gut by vomiting causes the gut to become distended by ensuing sustained increments of the intraluminal pressure attended in turn by interference with the blood flow and satisfactory oxygenation. By severing of the terminal ileum and anastomosis of the proximal end to the stomach (end-to-side), it was found possible to keep a dog alive for fifty-six days.

Demonstration of the possibility of relief of certain mechanical obstructions by suction applied to an inlying duodenal tube supports the belief that distention with its associated sequelæ was the item of chief importance in causing death in ileal obstruction. The agents causing the distention are gas and the digestive juices. McIver and his associates have shown swallowed air to be the principal source of gaseous distention of the stomach after abdominal operations. In this laboratory it has been shown that swallowed air accounts for about 68 per cent of the gas present in instances of simple mechanical obstruction. Having in mind the great absorptive capacity of the small intestine, it is quite reasonable to assume that, if swallowed air could be excluded from the intestine even in the presence of obstruction, the digestive juices could be absorbed and obstruction of the terminal ileum tolerated fairly well.

A method of exclusion of swallowed air from the intestine by cervical esophagostomy was performed in dogs by a two-stage operative procedure. In 11 such dogs the average survival period after the establishment of complete occlusion of the terminal ileum amounted to thirty-six days. One of the animals survived for a period of fifty-seven days. The authors found that dogs in which a long closed loop of esophagus, stomach, and entire small intestine was made absorbed the digestive juices when swallowed air was excluded. At autopsy the gut was usually found collapsed. The exclusion of swallowed air obviates the distention factor. It also relieves the sequelæ of decreased viability and increased permeability which attend sustained increases of intraluminal pressure.

The experiments indicate that complete occlusion of the terminal ileum may be well tolerated if the gut is not allowed to become distended by swallowed air. In effect, the experiments indicate that the mechanical factor of distention and not a "toxic factor" accounts for the lethal issue in ileal obstructions. JOHN W. NUZUM, M.D.

Barbieri, A.: The Roentgen Image in Ascariasis (L'indagine radiologica nell'ascaridiasi). *Radiol. med.*, 1939, 26: 197.

Barbieri insists on the great value of roentgen diagnosis of ascariasis. In the beginning, ascarides were recognized from a negative image by means of the ingestion of opaque substance; but later they were also demonstrated without the help of opaque substance, or by means of some natural contrast, such as that offered by gas present in the intestine or injected for that purpose (Figs. 1 and 2). When ascariasis is suspected, roentgen examination without the use of opaque substance should never be neglected, the exposure being kept as short as possible and the erect as well as the recumbent posture being used. Hydrogaseous levels present in the abdomen may be very helpful in demonstrating the ascarides when part of their body is immersed in the liquid and the other part is free in the gas. Masses of ascarides may be revealed by fine transparent striæ running in a parallel direction or forming a network: this is seen especially in cases of intestinal obstruction by the worms. When the digestive tube of the ascaris is filled with gas, a fine transparent line will be found to run through the length of the body of the parasite, or will appear as a transparent point in the center of a disc, depending on the incidence of the rays.

The easiest way to diagnose ascariasis roentgenologically is by the use of opaque substance administered to the patient who should be fasting since the evening before the examination: the opaque meal consists of water, 200 c.cm.; barium sulfate, 150 gm.; and a little sugar and cocoa. Some spoonfuls of thick solution are given first, as for the study of the gastric folds, especially if the presence of ascaris in the stomach is suspected; then the whole meal is ingested. The upper part of the intestine can be examined within a few minutes and the entire small intestine in about two hours. The ascarides are demonstrated by the presence of filling defects: in the lower parts of the intestine, especially in the erect posture, it may be necessary to have recourse to certain manipulations to separate and compress individual loops in order to show the presence of filling defects. Generally, only a short part of the body of the parasite is visible, but the manipulations may in this case succeed in demonstrating more of it by distributing better the opaque substance. Excessive presence of opaque substance obliterates the parasite. Repeated observation of the intestine is recommended. The most common aspect encountered is that of a streaky filling defect with parallel, well limited borders, in the vicinity of which the barium shadow assumes a gradual haziness which increases toward the axis of the body of the worm and gives the impression of roundness of the body. If an extremity of the parasite is visible, it shows the characteristic shape. The width of the image varies from 3 to 8 mm.; generally, the length and thickness of the body of the worm cannot serve to distinguish a male from a female. The

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 1. Curved streak image of ascaris directly visible without means of contrast.

Fig. 2. Disc image of ascaris with digestive tube filled with gas (appeared during a pyelography).

Fig. 3. Digestive tube of ascaris filled with barium; to be noted are some clear areas which are filling defects due to the presence of ingesta or of gas.

filling defect due to ascaris must be differentiated from some aspects of the intestinal wall simulating the presence of the parasite: manipulations often interrupt the suspicious parallelism in the wall, or change the position of the ascaris.

When the digestive tube of the worm is filled with barium, it appears as an opaque streak, from 2 to 3 mm. thick and from 10 to 15 cm. long, possessing activity and passive motility, or in the form of an opaque point in the center of a disc-like filling defect. The association of the various images mentioned heretofore facilitates the diagnosis. After complete evacuation of the opaque meal from the small intestine of patients having ascariasis, various opaque streaks may be found, short and straight, slightly curved, or very sinuous images represent the barium-filled digestive tubes of the ascarides (Fig. 3). The aspects of the digestive tubes vary according to the degree of filling or evacuation, and some show in parts a fine and regular dentation. A differential diagnosis must be made between these digestive tubes and a barium-filled appendix, and stratifications of opaque substance remaining on the body of the worm. The presence of barium in the digestive tube has been demonstrated in expelled ascarides and its elimination from the tube has been observed roentgenologically, but the parasites show an individual behavior toward ingestion and evacuation of barium. Ascarides possess active motility which at times becomes abnormal because of unfavorable ambient conditions in the intestine.

RICHARD KEMEL, M.D.

Wahren, H.: The Neurogenic Factor in Strangulation Ileus. *Acta chirurg. Scand.*, 1939, 82: 57.

The author believes that in spite of intense research work on the pathophysiology of ileus disease, we still are ignorant concerning the direct cause of death in strangulation ileus. In clinical cases, the peritonitis resultant from the gangrenous bowel is no doubt responsible for the lethal issue. Consequently, we have to consider a contributory toxic factor, although it has not been possible to ascertain the chemical nature of this supposedly toxic factor. The substance with the strongest toxic effect obtained from a strangulated loop of bowel is histamine.

In a series of experiments on animals with multiple strangulations of the lumen of the small bowel, multiple small strangulations of the small intestine caused the death of the test animal more quickly than the production of ischemia in the whole of the small intestine. The writer concludes that a neurogenic factor is probably significant in the lethal issue of strangulation ileus. JOHN W. NUZUM, M.D.

Hedin, R. F.: Polypoid Disease of the Colon. *Surgery*, 1939, 5: 161.

Much interest has been shown in recent years in polypoid disease of the colon. Modern methods of colon examination are no doubt largely responsible for the increasing frequency with which the lesions are found. The malignant potentialities of these tumors have likewise been the basis of interest in many of the pathological reports.

Considerable confusion exists in the terminology and in the classifications used in the literature regarding polypoid lesions in the colon. In 1916 Murphy stated: "The etiology of intestinal polyps . . . like the common wart . . . is shrouded in mystery; whence they come, why they go, is like the riddle of the Sphinx." Strictly speaking a polyp is a growth from a mucous membrane, either pedunculated or sessile, made up of hypertrophied mucous mem-

brane, or it may be a true tumor. Polyps occur as single or multiple tumors. Multiple polyps may mean two polyps located in the colon or thousands of polyps studding the entire large bowel. By appending the name of the segment of colon involved in the description of the condition, a more straightforward terminology is possible. Thus, for example, when only the sigmoid contains polyps, the condition is referred to as polypoid disease of the sigmoid. When the entire colon is lined with polyps, it is known as multiple polypoid disease of the entire colon.

There is definite evidence that polypoid lesions of the colon undergo malignant changes. Nowhere is it possible to demonstrate more clearly the logical transition from simple inflammatory hyperplasia to morphological, pathological, and clinical adenomas and carcinomas. According to reliable investigators almost all recorded cases of multiple polyps of the colon eventually become malignant.

In spite of the fact that much study has been given to this disease, the cause is not understood. The appearance of polypoid growths in the colon, secondary to ulcerative colitis, is relatively common. Among other primary causes of these growths are amebiasis, bacillary dysentery, and other infections of the colon. Multiple polypoid disease limited to a segment of colon seems to differ etiologically and pathologically from multiple polypoid disease of the entire colon.

As to incidence, multiple polypoid disease is usually considered a rarity. If routine examinations of the rectum and colon were established it is quite possible that such an opinion would no longer obtain. Multiple polypoid disease of the entire colon is said to be most common between the ages of fifteen and thirty-five years. Multiple polypoid disease which does not refer to the entire colon seems to be more frequent in older individuals. It is possible that the two conditions are different clinical entities. The distal colon and rectum are involved most frequently.

The symptoms vary with location; often they are few and mild, then, again, the bowel habits may be changed from norm to marked diarrhea; blood and mucus may be present in the stools. Anemia may follow the loss of blood. Intermittent crampy, colicky pain may be the initial symptom. Partial intussusception may occur as the result of violent peristalsis. Borborygmus and tenesmus are frequent when the polyps are located in the colon and rectum.

As to diagnosis, a carefully taken history, together with an examination of the rectum and distal colon, is usually sufficient to suggest the diagnosis. Sigmoidoscopic examinations and double contrast stereoroentgenographs establish the diagnosis.

With regard to treatment, until the etiology of polypoid disease is better understood, all therapeutic measures must be directed to the eradication of the tumor tissue. Various types of treatment are in use. Among these are dietary measures aimed at the reduction of roughage, and astringent drugs, such as quinine, tannic acid, and magnesium chloride, used in the form of colonic irrigations, all giving unsatisfactory results. Deep x-ray therapy producing the passage of grape-like necrotic growths in the stools caused improvement. However, no case has been reported in which all polyps have disappeared following this therapy.

The author proposes fulguration of all polyps within the reach of the sigmoidoscope. When a segment of the colon is involved with polypoid disease or when only a relatively few polyps are present throughout the colon, it would seem rational that an attempt should be made to remove the tumors successfully without sacrificing the entire colon. Fulguration of the tumors through a properly placed colostomy appears to be the only possible method by which this objective could be attained. The danger of fulgurating too extensively, with resulting perforation, should always be kept in mind.

Divergence of the fecal current by the use of ileostomy and colostomy occasionally has been followed by the disappearance of the tumors in the portion of the bowel put to rest. When multiple polypoid disease of the entire colon is present, total colectomy offers the only hope for those unfortunate individuals affected.

To recommend a radical procedure, such as a colectomy, imposes a great responsibility on the surgeon and a great danger on the patient. In this connection one is confronted with many perplexing questions.

Several patients with colostomies were studied at Cook County Hospital. It was found, by careful manipulation of the sigmoidoscope, that the interior of almost the entire colon could be visualized. Had the colostomy been made with the idea in mind of passing a sigmoidoscope, the visualization of the interior of the bowel would have been greatly facilitated. The success with which the interior of the bowel could be seen strongly suggests that polyps in the colon could easily be fulgurated.

The procedure proposed by the author could be carried out in one or two stages. It is proposed that if polyps are present in the left colon they could be fulgurated through a colostomy in the left colon. A colostomy in continuity would obviate the necessity of crushing a spur when fulguration of the tumors was completed. The colostomy could be closed over and the colon replaced into the peritoneal cavity. Protective walling off of the peritoneal cavity would safeguard against peritonitis from the exteriorized bowel.

MATHIAS J. SEIFERT, M.D.

Sahyoun, P. F., and Oppenheimer, A.: Some Fresh Aspects of Appendicitis: A Joint Roentgenological and Histopathological Study. *Am. J. Roentgenol.*, 1939, 41: 188.

This study represents an attempt to correlate the roentgenological and the histopathological findings in various manifestations of appendicitis, and by this method of approach to contribute to the elucidation of one of the many aspects of the problem.

Filling of the appendix depends upon an extrinsic mechanism; namely, the peristaltic pressure exerted by the cecum. Emptying of the appendix, on the contrary, is intrinsic in nature, being due to appendicular peristalsis. By roentgenological observations covering a period of seven years the authors were able to determine that an appendix is healthy when it fills within six hours after the beginning of gastric evacuation, empties before the cecum does, is uniform in caliber, and is dense and homogeneous in contrast. Free mobility and absence of tenderness are not essential points.

Normally, there is a balance or complementary correlation of cecal and appendicular peristalsis. In the course of the passage of barium through the colon, cecal peristalsis becomes slower and appendicular peristalsis stronger; thus the contents of the appendix is forced back into the cecum. Therefore, when the cecum is empty, retention of barium in the appendix must be due to the inability of the appendix itself to expel the barium it contains, and not to any extra-appendicular interference.

Stasis in the appendix indicates a disorder of intrinsic appendicular activity. In appendicitis, whether acute or chronic, stasis in the appendix itself is the leading roentgen sign. This stasis is isolated. Barium is retained in the appendix after evacuation of the entire colon or, at least, of the cecum. Appendicular stasis coexistent with colonic stasis is rare and of no diagnostic significance. Even in those acute stages in which swelling of the mucosa causes scanty and delayed filling, stasis is always associated with the other findings.

The authors observe that whenever stasis was found roentgenologically, certain histopathological signs of chronic inflammation were demonstrable in the muscularis of the appendix, especially with lymphocytic infiltration and degenerative changes in the ganglion cells of the plexus of Auerbach and Meissner. It is of special importance to note that foci of lymphocytic infiltration were found scattered throughout the muscularis, and at times also in the serosa, in practically all the cases of acute and subacute appendicitis observed by the authors. The significance of this statement is emphasized by the fact that in the experience of the authors, practically all cases of acute appendicitis were cases of acute appendicular obstruction.

Several factors may lead to acute appendicular obstruction because of the following facts: (1) the lumen of the appendix is much narrower than that of the cecum, (2) the musculature of the appendix is proportionally thicker than that of the cecum, (3) the filling of the appendix is dependent upon cecal peristalsis provided the appendix is open and relaxed, (4) the emptying of the appendix depends upon its own mobility, and (5) pressure in the cecum may force material into the lumen of the passive appendix, which the latter can expel only with difficulty. Consequently, when the wall of the appendix is chronically inflamed, whether with scar formation or without it, the existence in that wall of the chronic lesion described may lead to interference with its mobility and, hence, to obstruction. As is well known, necrosis results from obstruction, and thus the balance between the tissues and the microorganisms present is upset, in favor of the latter, and acute inflammation is induced.

The authors stress the fact that motor disturbance associated with chronic inflammation seems to be an essential factor in the production of acute appendicitis. While it is difficult to prove this statement directly, the correlation between demonstrable motor disturbances and signs of chronic inflammation in the intrinsic neuromuscular system of the appendix is strong presumptive evidence of the correctness of this conclusion.

Inflammatory edema, indicative of acute inflammatory swelling of the appendicular mucosa, may be recognized roentgenologically by circumscribed rounded prominences bulging into the lumen of the appendix. These semilunar prominences are from 4 to 8 mm. in length, about 2 mm. high, sharply defined, and smoothly rounded. By their persistence and by their globular outlines these formations are easily distinguishable. MATHIAS J. SEIFERT, M.D.

Grettve, S.: Pathological Conditions Following Trauma in the Region of the Appendix, So-Called Traumatic Appendicitis (Ueber posttraumatisch auftretende Krankheitszustaende in der Appendixgegend—sog. traumatische Appendizitis). *Acta chirurg. Scand.*, 1939, 82: 11.

Interest in a possible relationship between trauma and appendicitis was aroused by a personal experience wherein a fall from a bicycle, resulting in some overextension at the hip-joint, eventuated a few days later in increasingly threatening symptoms similar to those of appendicitis, but upon operation a retroperitoneal hematoma, without evidence of infection, was the sole finding. The records of the surgical department of the hospital where this case had been handled (St. Goeranskrankenhaus, Stockholm), during the years 1930 to 1936, inclusive, disclosed another instance in which an allegedly "stretching" injury at the hip-joint resulted in the removal of a normal appendix and a case in which overexertion (unaccustomed bicycle-pedaling) led to symptoms indicating appendectomy. The appendix in the latter case seemed to be normal upon removal, but microscopically it disclosed chronic inflammatory changes. Two patients who, following accustomed exercise in the gymnasium, developed peritonitic symptoms were found at operation to be actually suffering from an acute appendicitis. In another case a laborer leaning over a bar, in trying to lift a heavy weight, bruised the right lower quadrant and four days later was proved to have a walled-off retro-appendiceal abscess and a badly nicked, adherent appendix, which was almost discontinuous at the point of adherence. From another hospital came the report that a seamstress had suffered a fall, and struck the right lower quadrant on the pavement. This allegedly made worse an al-

ready longstanding, vague abdominal symptom complex, and at operation a month later, retroperitoneal approach to the appendiceal region uncovered an abscess, which was conceded to be of probable appendiceal origin. Finally, there were three reports in the proceedings of the Swedish Compensation Board (Reichsversicherungsanstalt)—one of a sailor falling into the hold of a vessel and injuring the lower abdomen with rupture of the appendix who received compensation; another of a woodchopper who was struck in the upper abdominal region by a tree-trunk and presented a perforated appendix, to whom compensation was denied; and a third, of a salesman who was thrown with his lower abdomen against the steering wheel of a car, in whom a gangrenous appendix was found and to whom compensation was denied. These cases complete the author's review of the more recent Swedish literature.

An extensive examination of the entire medical literature discloses that the majority of these cases are of the same general character and occur following a more or less severe trauma, particularly to the abdominal region, the symptoms suggesting appendicitis, and at operation there is found to be present an appendicitic attack in no way differing from nontraumatic appendiceal inflammatory processes. Exhaustive study, however, led Grettve to the conclusion that the significance of trauma as the cause of post-traumatic pathological conditions in the appendix has been very frequently overestimated, and that the appendix is much more frequently the seat of old invalidating changes or in an inflammatory state at the time of the accident than is generally assumed. In the cases so far operated upon it was scarcely possible to determine to what extent the duration and the final issue of the disease were influenced. Febrile conditions appearing immediately after the injury would suggest an already developing inflammatory process. Early operation is necessary in these cases with careful study of the removed organ for evidences of recent trauma, or for old cicatricial processes. Fecaliths may perhaps interfere with the self-emptying function of the appendix. The history must be carefully taken and a study of the sedimentation rate of the blood must be made, since Troell (1925–26) has shown that in appendicitis the sedimentation rate is at first normal and only rises to high values twenty-four hours later. In one case compensation was refused partly on the basis of an erythrocytic sedimentation rate of 23 mm. within twenty-four hours following the trauma.

JOHN W. BRENNAN, M.D.

Elman, R.: Peritonitis Due to Ruptured Acute Appendicitis in Children; Influence of Delay on the Operative Mortality. *Am. J. Digest. Dis.*, 1939, 5: 804.

This paper deals with a study of the results obtained in the treatment of peritonitis due to ruptured appendicitis in children under fourteen years of age. In general, there are two points of view concerning the management of such cases. From one point of view immediate operation to remove the source of infection is advisable; while from the other postponement of the operation is urged. In the literature on this subject, it is difficult to gather data, regarding children at least, on the relation between mortality and the period elapsing between the child's admission to the hospital and operation.

The clinical data represent a series of 181 cases in children with a final diagnosis of acute appendicitis which ruptured and resulted in a local or general peritonitis. All of these cases were arranged according to the time elapsing between admission and operation, and were further subdivided into "toxic" and "non-toxic" groups. It was not difficult to divide the cases into the latter two groups for, in most cases, the general appearance and behavior of the child was more indicative of toxicity; the existence of severe prostration was always assumed to be of great significance. There were 33 patients in the "toxic" group. It is not true necessarily that the difference in toxic manifestations was always due to a difference in the duration of the disease. Many of the children in the "toxic" group had been taken ill but from twenty-four to forty-eight hours before admission; whereas, a number of those in the "non-toxic" group presented a history of having been ill several days before the onset of the attack. It must be true that the virulence of the organism played an important rôle in the severity of the general reaction. Obviously, any delay immediately following the onset, which can be determined, allows rupture to occur, and increases the mortality tremendously. Once rupture has occurred, the duration of the disease still plays an important rôle in mortality, but the virulence of the organism plays an equal if not greater part.

The mortality for the whole group of 181 cases was 15.5 per cent; in the "non-toxic" group the mortality was only 6 per cent, while in the "toxic" group 57 per cent of the children succumbed. In arranging all cases according to the hour of operation, the mortality shows no consistent trend in the groups operated upon at various intervals following admission. In considering all cases, there is no progressive lowering of the mortality with increasing delay. A mortality of 14.5 per cent occurred in the cases of children operated upon within eight hours following admission; whereas, in those operated upon after eight hours, 18.5 per cent died. This difference is too small to be of much significance.

More decisive findings are observed when the cases are separated into "toxic" and "non-toxic" groups. It is in the "toxic" group that the period of time elapsing between admission and operation seems of definite significance. A mortality of 70 per cent in the cases of children operated upon at once, in contrast to 30 per cent in those operated upon from nine to twenty-four hours later, indicates the value of delay in this type. The reason is obvious when one considers that most of these children in the "toxic" group were extremely prostrated, dehydrated, had

had no rest, and had often been ill-treated at home. The child should be put to bed, given good nursing care, and parenteral fluids; he should be rested and given a transfusion if necessary, and dilatation of the stomach should be relieved. If all these requirements are met before operation (and the general condition has improved enough), the mortality will be cut more than one-half.

In the "non-toxic" group the findings are in reverse to those in the "toxic" group. The mortality was lowest (3.5 per cent) in the children operated upon within eight hours, while it was 15 per cent in those operated upon eight hours or longer after admission. Thus, in patients in good condition, delay increases the mortality.

The difference in mortality may be graphically expressed as follows:

	Mortality
Toxic cases: operation within eight hours after admission	70 per cent
Toxic cases: operation after eight hours	30 per cent
Non-toxic cases: operation within eight hours after admission	3.5 per cent
Non-toxic cases: operation after eight hours	15.0 per cent

The danger of a policy of unqualified delay is obvious from these findings. The general practitioner does not realize that expectant or non-operative therapy is reserved for a really small percentage of patients who should not have been permitted to develop peritonitis. It is often difficult to tell clinically whether there is a peritonitis, and whether or not it is spreading. From the findings, then, the necessity for immediate operation is clear whether the appendix is ruptured or not, and whether a peritonitis is present or not, provided the child is in a good condition to withstand the operation. If the child is not in such a state, then delay is advised to enable non-operative therapeutic measures to improve the general condition sufficiently to permit the operation. Thus, the question of immediate or deferred operation is answered not so much by an estimate of the extent of the lesion, but upon the extent to which the lesion has affected the general condition of the child. HARVEY S. ALLEN, M.D.

Charrier and Barraya: Abdominoperineal Amputation with Hysterocolpectomy for Cancer of the Rectum (Amputation abdomino-périnéale avec hystéro-colpectomie dans le cancer du rectum). *J. de chir.*, 1939, 53: 322.

In a review of the results obtained in 158 operations for cancer of the rectum, the author formed the following rule for the technique of radical removal of cancer of the rectum: abdominoperineal amputation and sigmoid depression without artificial anus in selected cases, with artificial anus in others; the peritoneum is completely closed and the pelvic cellular tissue adequately drained. No closed intestinal cul-de-sac is preserved. Certain cases, in

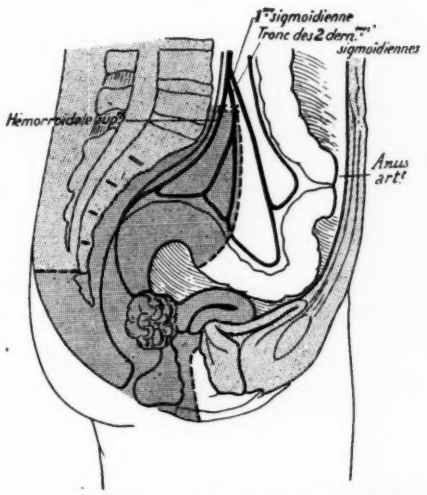

Fig. 1. Schematic section showing the extent of the exeresis by abdominal amputation combined with hysterocolpectomy. The usual origin of the sigmoid vessels. A single ligature is placed in the mesenteric artery between the first sigmoid and the trunk of its two branches.

which the neoplastic process has invaded the female genital organs, require removal of a part of the genital tract. Unless technically impossible this should be done *en bloc*. In some cases surgeons have removed the genital organs to facilitate approach to the rectal cancer. This is not justifiable in the opinion of the authors. However, in cases in which the genital organs are included in the carcinomatous process, such a procedure may save the life of the patient. In cases of low cancer involving the inferior two-thirds of the vagina, and in which exploration has revealed an intact pouch of Douglas, posterior vaginal cul-de-sac, and isthmus, a posterior colpectomy will suffice, the uterus being preserved to insure better pelvic statics. In cases of cancer from 7 to 10 cm. from the margin with invasion of the pouch of Douglas and isthmus, it is better to perform an extensive colpohysterectomy combined with the abdominoperineal amputation. Rectal amputation is supplemented by a Wertheim operation. The problem of elimination must then be met. In 1 case the depressed sigmoid formed a satisfactory anus in the lower part of the sacral concavity. In some fortunate cases a perineal depression of the sigmoid obviated the necessity for an artificial anus; in other cases a permanent iliac anus was established. The iliac anus is established in a preliminary operation.

The extirpation of the cancer is accomplished in two stages: namely, an abdominal stage with dissection of the two ureters and bladder, which permits isolation of the uterus, parametrium, upper part

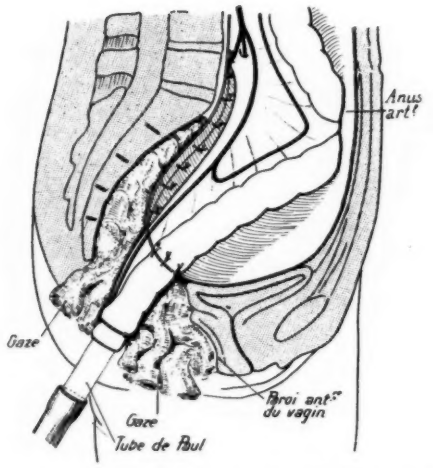

Fig. 2. Schematic drawing showing depression of the colon, peritonization, and drainage after completed operation.

of the vagina, the rectum, and its sheath. The mesentery is united and the whole mass is removed in a second stage, or perineal stage, which follows immediately and is completed by resection of the depressed sigmoid. During the days following the establishment of an iliac anus, the patient is vaccinated with three doses of propidon at intervals of two days.

The second operation is performed fifteen days after the first under spinal anesthesia according to Jones. The abdominal stage includes median pubo-umbilical incision, exploration of the abdominal cavity with careful search for distant lesions (distant peritoneal metastases constitute a contra-indication), and careful palpation of the pelvic mesocolon and accessible glands. A fixed adenopathy precludes any chance of successful operation. If none of these contraindications is present the lesion is examined with regard to its location in the intestine, its axial and peripheral extent, and its mobility in the sacral plane. The lesion is usually adherent to the genital organs. The next stage is conducted like the beginning of a radical hysterectomy by division of the ligaments and dissection of the ureters. The lateral and anterior surfaces of the vagina are then liberated. Finally in the rectosigmoid stage the vessels are ligated and the lateral and posterior surfaces of the rectum are liberated. The sigmoid is depressed and its lowest point marked for future resection. This point must not be too close to the lesion. A careful exploration of the vessels is needed to determine the site of division according to the anatomical distribution. Liberation of the posterior surface of the rectum is easy when the mesentery and vessels have been cut. The plane of cleavage should be chosen sufficiently near the sacrum to make sure that one is proceeding posterior to the rectal sheath. Hemorrhage indicates that the plan of cleavage chosen has been too far anterior. The detachment should be made in the vicinity of the sacrococcygeal junction. A few layers of gauze are introduced before the abdomen is closed, to absorb septic secretions, and peritonization is then undertaken. In this stage one has attained isolation of the recto-uterovaginal mass, division of the rectosigmoid vessels, peritonization, and localization and retraction of important vessels and the ureters.

In the perineal stage the exeresis of the organs is completed and peritonization finished. A purse-string suture closes the anus. A V-shaped cutaneous incision is made, the two branches terminating at the union of the posterior and two anterior thirds of the labia minor and the apex at the point of the coccyx if this is short, or at the sacrococcygeal articulation if it is long. The classical routine is then followed with retraction of the cutaneous flaps, resection of the coccyx, division of the levators, rectosacral detachment, and completed section of the vagina and of the attachments of the recto-vaginal mass. Peritonization is then completed, the intestine resected, and a Paul's tube introduced. Drainage is afforded by 4 large iodoform gauze drains. A vesical catheter is introduced and kept in place for from eight to twelve days with the usual precautions. Postoperative shock is considerable as a rule. Serum, cardiotonics, and blood transfusion will aid the patient through this first period. Occasionally Vincent's anti-gangrene serum has been found of value (30 to 40 c.cm. daily). After from twelve to fifteen days the wound begins to granulate but heals slowly. After from two to two and one-half months a depression admitting two fingers will remain. The anterior surface is constituted by the vaginal wall which little by little extends to meet the epidermic covering of the perineum.

The technique and its details may be modified to suit various individual indications. Thus, if the uterus is fibromatous, a high subtotal hysterectomy may precede the abdominal stage. In 1 case a rectal cancer had invaded the stump of an old subtotal hysterectomy. The cervix and bladder were isolated preceding the other stages. The colon may be very short in some cases, when it may have to be severed below the iliac anus. Detailed reports of 7 cases are included. EDITH SCHANCHE MOORE.

LIVER, GALL BLADDER, PANCREAS, AND SPLEEN

Cova, P. L., and Tempini, G.: Experimental Research on the Roentgenographic Anatomy of the Extrahepatic Biliary Ducts, Excluding the Gall Bladder (Ricerche sperimentali su l'anatomia radiografica delle vie biliari extraepatiche, esclusa la cistifellea). *Radiol. med.*, 1939, 26: 226.

Cova and Tempini describe in detail the accepted anatomy of the extrahepatic biliary tract and discuss

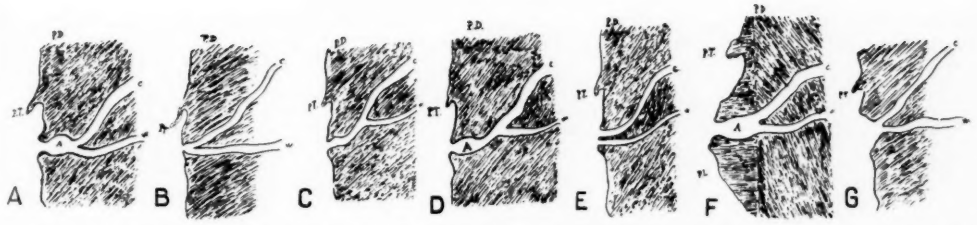

Figure 1. Various modalities of termination of the biliary pancreatic duct. PT, plica transversalis; DP, duodenal wall; A, ampulla; PL, hypertrophic mucosal fold with longitudinal direction.

the various types of termination of the biliary pancreatic duct found in their studies (Fig. 1), which were conducted on 44 cadavers of individuals varying in age from seven years to advanced senility. From 15 to 25 c.cm. of a weak solution of barium sulfate mixed with potato starch were slowly injected through an apical cholecystostomy after evacuation of the bile, and the first few c.cm. of the solution were allowed to flow into the duodenum to avoid differences in opacity due to admixture of bile. The cholecystostomy opening was closed after the injection was completed. A first roentgenogram was taken in anteroposterior exposure and then the duodenal mucosa corresponding to Vater's orifice was clamped and slight pressure was exercised on the gall bladder to distribute the solution evenly in the biliary tract, after which a second roentgenogram was taken in the same position, and often a third in right oblique posterior position, in order to obtain total representation of the entire biliary tract.

In sagittal exposure the biliary tract is included within an area limited by lines passing through the upper border of the eleventh dorsal vertebra above, the transverse process of the fourth lumbar vertebra below, and the prolongation of the middle clavicular line laterally. The biliary tract is rarely superimposed on the spine. It shows the form of a curve with lateral and anterior concavity, the radius of the curve becoming shorter as the cystic duct lengthens. The biliary ducts are generally long and narrow in longilinear types, and short and wide in brachylinear types. In children, the biliary ducts are of about the same caliber in their entire course (Fig. 2).

Good visualization of the entire biliary tract was obtained in most cases. The hepatic ducts had a diameter varying from 2 to 5 mm. and a length of from 15 to 30 mm.; their caliber was generally uniform and they were found between lines running through the upper border of the eleventh dorsal and

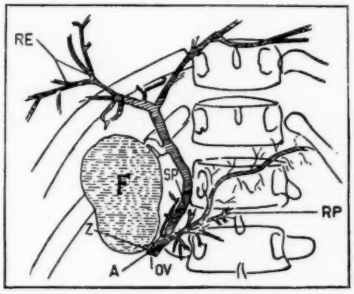

Figure 2. Child aged seven years. Termination of the biliary tract as in Figure 1-A. A, ampulla; OV, closed Vater's orifice; RE, intrahepatic branches; RP, intrapancreatic branches; SP, beginning of pancreatic tract; Z, dentations due to crypts of the biliary glands.

the base of the first lumbar vertebræ. The common hepatic duct had a diameter varying from 3 to 15 mm. and a length of from 2 to 7 cm.; its caliber was larger in its distal part and it was found between lines running through the intervertebral disk between the eleventh and the twelfth dorsal and the base of the third lumbar vertebræ. The cystic duct (diameter from 2 to 5 mm. and length up to 8 or 9 mm.) ran obliquely or transversely, was tortuous, and made a horizontal T or a V on joining the hepatic duct; it was found between lines running through the base of the eleventh dorsal and the upper border of the third lumbar vertebræ. The choledochus (diameter from 5 to 17 mm. and length of from 2 to 10 cm.) was straight or slightly arched, and ran obliquely from above downward to the right and the front; it could be divided into three parts: (1) suprapancreatic, which may be absent altogether; (2) pancreatic, which is narrowed; and (3) subpancreatic or intraparietal, running in the duodenal wall. The diameter of the pancreatic part decreased rapidly to form a funnel ending in a filiform canal, and was joined mesially by the duct of Wirsung, which was visualized for about 1 cm.; terminally, the filiform canal may curve suddenly to the right, perpendicularly to the duodenum. Injection of the opaque substance under moderate pressure changed the roentgen aspect of the biliary tract: the pancreatic narrowing disappeared, the filiform part was dilated, and the ampullary formation, when it was present, became evident. Obstruction of Vater's orifice may make Wirsung's duct visible in its entire course. The presence of glands and crypts along the biliary tract may give an irregular appearance to its borders, and differences in age introduce important morphological changes. RICHARD KEMEL, M.D.

Wolfer, J. A.: Further Evidence That Reflux of the Pancreatic Juice May Be the Etiological Factor in Gall-Bladder Disease. *Ann. Surg.*, 1939, 109: 187.

It has been suggested that obstruction of the cystic duct represents the primary cause of gall-bladder disease and that infection, when it does occur, is a secondary phenomenon. In many instances, however, no obstruction can be found. Judd suggested a possible chemical cause for disease of the gall bladder in these cases. Wolfer, as a result of considerable experimentation on dogs, has been able to show that pancreatic juice, when introduced into the gall bladder, produces pathological changes in the wall of the gall bladder, and the possibility that pancreatic juice may enter the gall bladder has been demonstrated. India ink introduced into the terminal end of the common duct of the dog was later recovered in the gall bladder. Attention was also called to the anatomically proved common pathway between the pancreatic and biliary tracts in 284 of 652 specimens examined by various investigators. Also, recent cholangiographic studies have demonstrated a physiological common pathway between the two ducts.

Any obstruction at the sphincter of Oddi, be it spastic or organic, will result eventually in the passage of pancreatic juice into the gall bladder in those instances in which a common pathway is present. The agent which activates the pancreatic juice may be enterokinase (supposedly derived from the mucosa of the gall bladder), a substance liberated by broken-down cells, or contaminated pancreatic juice. One-tenth normal sodium-bicarbonate solution (the concentration of alkalinity in pancreatic juice) may also produce a violent reaction in the mucous membrane. With the theory, that the reflux of the pancreatic juice may be the cause of gall-bladder disease, in mind, it is recommended that some widespread observations be carried out. They should include the following: (1) repeated examinations of the drainage for amylase in all cases of gall-bladder and common-duct drainage; (2) cholangiographic studies to visualize the pancreatic duct in all cases of gall-bladder and common-duct drainage; and (3) study of the possibility of early history which is suggestive of biliary dyskinesia in all cases of gall-bladder and duct disease.

MANUEL E. LICHTENSTEIN, M.D.

GYNECOLOGY

UTERUS

Pelkonen, E.: Developmental Mechanism of the Metrorrhagias in Cases of Pedunculated Submucous Myomas (Zum Entstehungsmechanismus der metrorrhagischen Blutungen bei den gestielten submukoesen Myomen). *Acta Soc. med. Fennicae Duodecim*, 1939, Ser. B, 24: No. 2-3.

As an explanation of the frequent and serious interval bleeding in submucous myomas, especially as to why it is so characteristic of the pedicled variety, S. E. Wichmann, head of the department of gynecology at Helsingfors (whence this study originates), erected the so-called "caput succedaneum" theory. According to the theory the pressure of the muscular walls of the uterus against the opposed sides of the tumor—perhaps as the result of abnormal contractions induced by the irritation of the pull of the pedicle on the uterine wall, or as the result merely of a passive resistance to dilatation by the cervix in those cases in which the uterus is attempting to extrude the mass into the vagina—results in an engirdling zone of compression which interferes with the return of blood and lymph.

Wichmann based his theory entirely upon clinical considerations, however, and Pelkonen has been trying to procure histological substantiation for it. With this end in view the latter has made histological preparations from the lower pole, from the so-called "girdle-contact" zone, and, finally, from regions above this contact zone, in 4 cases of pedicled submucous myoma. (In a fifth case the submucous myoma, included for purposes of comparison, was protruding but was not yet pedicled. Findings resembled the others, only they were less pronounced.)

In all specimens from the lower pole, the findings were remarkably uniform: the covering epithelium appeared somewhat thickened with an abundance of mucous and submucous endometrial gland structures, which stained poorly over extensive areas and in many places were lifted away from the subjacent tissues by massive submucous hemorrhages, or were even entirely sloughed away. Extending throughout the mucosa and down into the tumor tissue itself were exhibited various stages of degeneration, lymph and blood stasis, and interstitial, per rhexin, and diapedesis hemorrhagic extravasations. This histological picture corresponded to the macroscopic appearance of the tumor at removal, the lower pole of which was always dark-reddish in color, somewhat edematous, and in places actually bleeding.

The specimens from the zone of girdle-contact, on the other hand, exhibited flattening of the covering epithelium; anemic, dense appearing tissues; closely crowded nuclei; and other evidences of considerable pressure. Those from above the contact-girdle zone were typical and need not be discussed. (The specimens from the endometrium of the uterus disclosed in every case that the endometrium was in the phase of secretion.)

From this study, therefore, Pelkonen believes that, although he has not unqualifiedly substantiated the truth of Wichmann's theory, he has at least erected a broad histological foundation for its acceptance.

JOHN W. BRENNAN, M.D.

Martines, S.: Changes in the Endometrium in Fibromyomas of the Uterus (Le modificazioni dell'endometrio nei fibromiomi dell'utero). *Riv. ital. di ginec.*, 1939, 22: 25.

In connection with his histological description of 37 cases of uterine fibromyoma, Martines considers the condition of the ovaries at the time of the surgical intervention. As it is impossible to draw a distinct line between subserosal, interstitial, and submucosal fibromyomas, he bases his classification on the prevailing seat of the tumors: thus he has examined 20 fibromas of prevailingly subserosal development (3 of which were intraligamental), 11 of prevailingly interstitial development, and 6 of prevailingly submucosal development.

In the 17 subserosal cases, he has observed sclerocystic degeneration of the ovaries 8 times, the presence of follicular cysts 3 times, and of lutein cysts 4 times. In the 3 intraligamental cases, the ovaries presented changes similar to those found in the subserosal cases. In the 17 interstitial and submucosal cases combined, sclerocystic degeneration of the ovaries was present 12 times, a lutein cyst was found in 3 cases, and a large follicular cyst in 1 case.

The histological examination showed a condition of glandular hypertrophy and hyperplasia common to all cases, but to a higher degree in the cases of tumor of intraligamental and subserosal development. So-called cystic hypertrophy was frequently present. In many cases, the metaplasia of the epithelium of the superficial layer of the endometrium toward the cubical or polygonal form was characteristic.

The histological findings exclude positively the possibility of attributing the changes of the mucosa to an inflammatory process, except in certain cases of fibroma with cavity development; on the other hand, it is necessary to take into consideration the ovarian changes which are constantly found in the presence of the tumor, no matter where its seat or its development may be: these changes can be summarized as sclerocystic degeneration of the ovarian parenchyma. In many cases, the metaplasia of the superficial epithelium of the uterine mucosa toward the cubical or polygonal form was associated with the presence of follicular cysts of moderate volume. Consequently, the changes of the endometrium in fibromyoma of the uterus are intimately related to characteristic pathological conditions of the ovary, just as the development itself of the tumor is inti-

mately related to the clinical signs which accompany it. RICHARD KEMEL, M.D.

Cosbie, W. G., and Henderson, D. N.: Carcinoma of the Body of the Uterus. *J. Obst. & Gynaec. Brit. Emp.*, 1939, 46: 32.

The authors report a combined clinical and pathological study of 55 cases of carcinoma of the body of the uterus, observed and treated during the period from 1929 to 1937. Although the number of cases is small and only recently a routine method of treatment was followed, a basis for discussion of the pathology, clinical features, and problems of treatment of this disease is provided. The body of the uterus is the second most common site for the occurrence of carcinoma in the female genital tract; carcinoma of the cervix is most common. The authors observe that in a series of 589 malignant gynecological specimens diagnosed in their laboratory, 19 per cent were of the body of the uterus. Carcinoma of the body of the uterus is a relatively slow-growing tumor with a tendency to spread over the surface of the endometrial cavity before deeply invading the myometrium. Because of its anatomical situation, this type of malignant growth is suitable for wide surgical removal. Distant metastatic growths occur fairly late, extension for the most part being direct, with the exception of lymphatic spread to the ovaries. With these favorable factors, the prognosis in carcinoma of the body of the uterus is good for a malignant disease. Survival varies from 24 to 61.1 per cent.

Following a study of the gross specimen or microscopic slides in this series of 55 cases, the tumors were graded according to cell differentiation and loss of polarity. The 4 grades corresponded more or less to Healy and Cutler's classification. Five cases were of Grade I, 20 of Grade II, 19 of Grade III, and 10 of Grade IV. The cases were studied to determine if any relation could be demonstrated between grades of malignancy, extent of disease, and duration of symptoms. No such relation was shown.

The average age of the 55 patients was fifty-eight years. Ten women were less than fifty years of age. Twenty-seven patients were nulliparas, 23 were multiparas, and 9 women had had 5 or more children. Bleeding was the cardinal symptom. Thirty-two patients developed postmenopausal bleeding, and in eleven the menopause had never been established. These reported continued and excessive bleeding. Although bleeding occurred in the rest of the patients, the chief symptom was vaginal discharge, occasionally described as blood-stained, dark brown, profuse, and foul-smelling. Progress of the disease was characterized by weakness and loss of energy rather than by pain.

Distortion of the uterus was absent in the majority of cases, and in 5 the uterus was fixed. It was enlarged in 34 patients, of normal size in 7, and atrophic in 8.

The diagnosis of carcinoma of the body of the uterus is suggested by the symptoms and physical findings, and established by curettage. The association of uterine fibroids with carcinoma of the body of the uterus was seen in 22 of the 55 patients. There were 4 patients with cervical polypi, and in these cursory examination might have attributed the symptoms to this benign lesion. The authors discuss at some length the therapeutic problem involved. The treatment of each patient suffering from carcinoma of the body of the uterus presents an individual problem, and the method to be followed is determined by certain factors. Primarily important is the classification: operable, technically operable, and inoperable. Pre-operative irradiation, total hysterectomy, and postoperative high-voltage therapy is considered best for the operable group, and high voltage irradiation for the technically operable cases will give the best results.

In conclusion, the authors observe that biopsy material obtained by curettage is not satisfactory for the grading of carcinoma of the body of the uterus. The extent of the disease, the grade of malignancy of the tumor, and the duration of symptoms do not bear any relation to one another. The grade of malignancy of the tumor did not have any prognostic value in this series. The most important symptom of carcinoma of the body of the uterus is bleeding. The diagnosis of carcinoma of the body of the uterus is made by curettage.

HERBERT F. THURSTON, M.D.

Keller, R., and Meyer, P.: Cancer of the Corpus Uteri (Quelques considérations sur le cancer du corps de l'utérus). *Rev. franç. de gynéc. et d'obst.*, 1939, 34: 149.

Keller and Meyer report 82 cases of cancer of the corpus uteri observed at the City Hospital of Strasbourg from 1919 to 1937. In the majority of these cases there was uterine bleeding after the menopause; the average age of the patients was fifty-six years. The diagnosis in most cases was made by curettage with microscopic examination of the specimens of mucosa so obtained; the only exceptions to this procedure were made in cases in which the presence of an associated benign tumor (fibroid or cyst) indicated a surgical operation with exploration of the uterus. The authors are convinced that curettage with histological examination of the tissue obtained is the most certain and satisfactory method of establishing the diagnosis of cancer of the corpus uteri. In 1 of their cases, however, curettage was followed by a fatal embolus, and in another case by phlebitis with a few small emboli.

In 13 of their cases the cancer of the corpus was associated with other uterine or ovarian tumors: in 5 cases with uterine fibroma, in 5 cases with ovarian cyst (1 of these a carcinomatous cyst), in 1 case with cancer of the cervix, and in 2 cases with sarcoma of the uterus. The association of uterine fibroma or ovarian cyst with carcinoma of the corpus is not unusual, but the association of a malignant tumor of another type in the same organ, as in the last 2 cases, is rare.

Of the 82 patients in this series, 55 were operated upon, 24 were treated by radiotherapy, and 3 were not treated. The untreated group included the patient who died from embolism after curettage, the patient who developed thrombosis with multiple emboli after curettage, and a third patient who refused all treatment. These 3 cases were all operable, so that the percentage of operability was high —70.7 per cent (58 of 82 cases). This high percentage of operability is not unusual in cancer of the corpus, and is due to the fact that this neoplasm remains localized in the uterine cavity for a considerable time. Of the 24 cases classed as inoperable and treated by radiotherapy, 6 were inoperable because of local metastases, and 18 because of the poor general condition, such as advanced age, obesity, and cardiac insufficiency.

Total abdominal hysterectomy was done in 22 of the 55 patients operated upon, vaginal hysterectomy in 26 and subtotal hysterectomy in 6 (later made total in 1 case). There was 1 failure following operation by the vaginal route which was followed by exploratory laparotomy. There were 14 patients in whom some postoperative complications developed (25.4 per cent); the most frequent of these were phlebitis, cystitis, pyelonephritis, and partial rupture of the operative wound (2 cases). There were 7 operative or postoperative deaths (12.7 per cent). One was due to pulmonary embolism after vaginal hysterectomy; 1 occurred in the case in which vaginal hysterectomy was attempted and failed; and 5 occurred after abdominal hysterectomy because of peritonitis in 3 cases (with septicemia in 1), and on account of bronchopneumonia or pulmonary edema in 2 cases. Total abdominal hysterectomy was employed chiefly in women in good general condition, in nulliparas, and in those women in whom the cervix could not be brought down easily. The vaginal route, which is attended with less shock, was used in obese patients, in those whose general condition was less satisfactory, and in multiparas in whom the cervix could be brought down easily.

In the cases treated by radiotherapy, radium by Regaud's method, deep x-ray therapy, or a combination of the two methods was used.

Of the entire series of patients, 60 were treated from 1919 to 1932, and of these, 44 were operated upon. In this group there were 6 postoperative deaths; 11 patients could not be traced; 4 have died (3 from recurrences and 1 from an intercurrent disease twelve years after operation); and 23 are living and without recurrence for more than four years after operation; all but 5 of the last group have passed the fifth year. Disregarding the case of death from intercurrent disease, there were 23 cures in 43 cases (53.4 per cent).

There were 14 cases treated by radiotherapy in the period from 1919 to 1932: 7 by radium alone, 3 by deep x-ray therapy, and 4 by radium and x-ray therapy combined. Of these, 5 could not be traced, 4 have died from the cancer, and 5 have been living and free from recurrence for more than four years; thus the percentage of cures was 35.7. While this figure is lower than that of the operated group, it must be remembered that only inoperable cases were treated by radiotherapy. Operation, the authors believe, is the treatment of choice in cases of cancer of the corpus uteri that are operable; in inoperable cases, radiotherapy is indicated as it may cure some cases beyond the reach of surgery.

ALICE M. MEYERS.

Repetti, M.: Late Results of Surgical and Actinic Treatment of Cancer of the Female Genital Apparatus, with Special Consideration of Cancer of the Uterine Cervix (Risultati a distanza della terapia chirurgica e attinica del cancro dell' apparato genitale femminile, con speciale riguardo al cancro del collo dell'utero). *Folia demograph. gynaec.*, 1938, 35: 659.

Repetti reports the results obtained with surgical and radium treatment of 206 cases of uterine cancer admitted to the clinics of Parma and Pavia from 1925 to 1934: in most cases, from five to twelve years have elapsed since the treatment. Generally, the radium treatment included the vaginal application of from 2 to 4 tubes of 10 mgm. of radium filtered by 2 mm. of platinum, followed by uterine application of 2, 3, or 4 tubes of the same content filtered by 1 mm. of platinum in rubber; from ten to fifteen days were needed for the irradiation. The 206 cases included 162 cancers of the uterine cervix, 33 of the uterine body, and 11 of the vagina and vulva. He compares the results of surgical and radium treatment obtained at various other institutes with those he reports and concludes that the school to which he belongs is working in the right direction. He uses the classification in four groups adopted by the League of Nations.

The cases of cancer of the uterine cervix treated with radium gave for all the groups considered together an absolute percentage of cure of 26.92 and a relative percentage of 28.56: the percentage of cure was 80 in Group I, 45 in Group II, 16 in Group III, and 0 in Group IV. On the other hand, with surgical intervention there was a relative global percentage of cure of 52.9 and an absolute percentage of 40.90: the percentage of cure was 68.75 in Group I and 31.25 in Group II. The percentage of cure was 50 in borderline cases in which surgical treatment was associated with radium therapy.

Comparison of the percentages of cure, death, and operative mortality in the operable cases (Groups I and II) treated with radium and surgery showed that radium treatment gave a total percentage of cure of 58.6, while surgery reached a percentage of 52.9, with a primary uncorrected mortality of 0 per cent for radium and of 6.8 per cent for surgery. After discussing the therapeutic indications, the influence of the histological form of the cancer on the final results, and the deaths by recurrence, the author points to the rare and slight complications caused by radium, the low percentage of primary operative mortality, and the importance of prophy-

lactic irradiation with radium in association with surgical treatment.

In cancer of the uterine body, the percentage of cure by surgical treatment is 55, which corresponds to the figures given by other schools; the percentage of cure with radium treatment, amounting only to 20, is explained by the fact that the patients were of advanced age and presented marked extension of the process. However, the small number of cases treated and the advanced stage of the disease when the patients came under observation do not allow the author to form an exact concept of the value of radium treatment in cancer of the uterine body or of surgical and radium treatment in cancer of the vulva and of the vagina.

In conclusion, the results obtained in operable cases of cancer of the uterine cervix are, in general, good with surgery as well as with irradiation, but the latter offers some advantages and presents fewer operative risks; in inoperable cases in which nothing is to be gained by surgery but amelioration within limits, and cure may be obtained with radium at times, the latter treatment should be used. In cancer of the uterine body, of the vulva, and of the vagina, surgery is still recommended.

RICHARD KEMEL, M.D.

ADNEXAL AND PERIUTERINE CONDITIONS

Quinto, P.: Primary Carcinoma of the Salpinx (Sul carcinoma primitivo della salpinge). *Riv. ital. di ginec.*, 1939, 22: 3.

Primary carcinoma of the salpinx is rare, as only about 370 cases have been reported in the literature. Quinto describes a bilateral primary alveolopapillary carcinoma of the tubes with omental metastases in a woman aged thirty-six years, who died from a recurrence of the tumor six months after the radical operation.

Most cases of primary carcinoma of the salpinx develop during the fifth decade of life and are unilateral. The diagnostic difficulties were increased in the present case by the fact that this woman had had a puerperium complicated by inflammation of the adnexa four years previously, after a normal pregnancy. It was more natural to suspect bilateral chronic adnexitis than a carcinoma, especially as the symptoms of pain and leucorrhea presented by the patient did not contradict the diagnosis of adnexitis. According to most authors the symptoms of tubal carcinoma are supposed to acquire peculiar characteristics. However, the fact is that the character of the pain varies greatly, as does also the leucorrhea. In connection with the latter, the differential diagnosis between carcinoma and hydrops tubæ profluens is not difficult because in the former the leucorrhea is intermittent only in the very early stages of the disease, and later the size of the tumor continues to increase notwithstanding abundant loss of fluid. A more important sign of the presence of carcinoma would be loss of blood or of serosanguineous fluid, and the diagnosis would be conclusive if neoplastic cells were found in the vaginal discharge. Changes in menstruation and disturbances of micturition may occur, but are not typical of tubal carcinoma.

Nothing more is known about the cause of primary tubal carcinoma than of any other type of malignant tumor. Histologically, tubal carcinoma may be of papillary, adenomatous, or alveolar nature; the alveolopapillary form would have the greatest tendency toward invasion of the tissues. The primary bilaterality of the tumor in the present case must be admitted because the right tube remained permanently obstructed from the previous inflammation, and transfer of tumorous elements by contiguity or by the lymphatic or circulatory route was out of the question. The omental metastases are to be considered as attachment metastases due to issue of tumoral material through the abdominal orifice of the left tube. Because of the difficulties of the diagnosis, the prognosis of tubal carcinoma is nearly always unfavorable. Radical surgical intervention is the only rational treatment; even if only one tube is found involved, removal of the uterus and adnexa is indicated. The postoperative prognosis is also unfavorable, on account of the tardiness of the intervention. Radium therapy may be used in case of vaginal metastasis. RICHARD KEMEL, M.D.

Pierra, C.: Ovarian Apoplexy; a Few New Observations (L'apoplexie ovarienne; à propos de quelques observations nouvelles). *Rev. franç. de gynéc. et d'obst.*, 1939, 34: 65.

An anatomical study of a certain number of cases of ovarian apoplexy convinced the author that the classical division of ovarian hemorrhages into two groups, viz., bleeding in the stroma and in the germinal tissues, should be abandoned. The so-called apoplectic process is found in the majority of cases, although massive bleeding is rare. Only quantitative differences exist between the hemorrhagic lesions of the stroma, the active tissue, and the entire organ.

Congestive phenomena and perifollicular hemorrhagic suffusions constitute the initial stage of the apoplectic process. Similar conditions are found as a rule in an attenuated form during the course of the normal maturation of the follicle, and therefore apoplectic accidents may be considered as a disturbance of the ovarian cycle. Apparently various transitions exist between the normal process of ovulation and the massive hemorrhages in the ovaries.

There is no symptomatology characteristic of ovarian apoplexy and there is no parallelism between the intensity of the anatomical lesions and the clinical phenomena. Acute forms may simulate an acute appendicitis or a rupture of an ectopic pregnancy. Operative findings and the results of histological examination demonstrate the existence of latent forms which seem to be relatively frequent and may be responsible for menstrual or intermenstrual pains.

Conditions under which the ovarian apoplexy occurs, and also certain experimental findings point

to the rôle of hormonal factors in the genesis of ovarian hemorrhages. A blood dyscrasia or an abnormal fragility of the capillaries may act as contributing factors. As the hemorrhages originate in the zone rich in terminal branches of the neurovegetative system, it may be concluded that a disturbance of the equilibrium of the sympathetic system of hormonal origin may be responsible for an ovarian apoplexy. Certain observations demonstrate the importance of a sudden discharge of a large amount of prolan. JOSEPH K. NARAT, M.D.

MISCELLANEOUS

Thompson, G. J.: Transurethral Operations on Women for Relief of Dysfunction of the Vesical Neck. *J. Urol.*, 1939, 41: 349.

A series of 24 cases of dysfunction of the vesical neck among women, in which 35 transurethral operations were performed, is presented.

The etiology of this disease was not definitely revealed by microscopic study of the tissue removed by transurethral operation. The hypothesis that it is caused by fibrosis in the sphincteric region seems fallacious in view of the fact that a considerable amount of fibrosis is found in normal tissue from this region. A possible explanation is that hyperplasia of the superficially lying epithelium or of the sphincter muscle occurs and causes urinary retention.

The results of operation were classified as excellent in 14 cases, good in 5 cases, fair in 4 cases, and poor in 1 case.

Removal of tissue from the entire circumference of the vesical neck is necessary to obtain a good result in all but exceptional cases, in which only incision might suffice.

Observation of the patient by the urologist for a number of years following operation is advisable, and treatment including dilatation with a Kollmann dilator will probably be necessary in some cases in order to maintain normal vesical function. The transurethral operation can be repeated with benefit if the urinary obstruction recurs.

MacLeod, D.: Hormone Therapy in Gynecological Conditions. *J. Obst. & Gynaec. Brit. Emp.*, 1939, 46: 15.

Acknowledgment is made by the author of the brilliant advances made in recent years in the chemistry and physiology of the endocrine glands. The disappointment experienced by many in the results of endocrine therapy in the more important functional disorders of women occurs because little discrimination is being employed in the use of this type of therapy. The cause of this is threefold: (1) the encouragement that the clinician gleans from reading commercial brochures on the subject; (2) the fact that little harm results from the use of endocrines in general; and, (3) the tendency of functional uterine disturbances to recover spontaneously.

Four hormones are available for use in endocrine therapy. The estrogenic hormones extracted from the urine and the placenta are responsible for the development of the external genitalia, the breasts, and the vaginal mucosa; they increase the size of the uterus and increase uterine sensitivity to contractions. They bring about the development of the hypertrophic phase of the endometrium and, in association with the corpus-luteum hormone, are responsible for normal menstruation. When given in large doses, or in small doses over a prolonged period, they will inhibit the gonadotropic activity of the pituitary gland. Estrogen is of value in the treatment of severe menopausal symptoms, especially those following the removal of ovaries in young women. Its value is proven in the distressing condition of kraurosis, primary senile vaginitis, and the vulvovaginitis of children.

So far as the treatment of amenorrhea is concerned, it has been shown that when associated with the use of corpus-luteum hormone, the estrogenic substance will produce normal menstruation; but it is incapable of inciting spontaneous activity, and is therefore of little value. Results of its use in primary dysmenorrhea occurring with a small uterus are unsatisfactory.

The corpus-luteum hormone, progesterone, transforms the hypertrophic phase of the endometrium into a secretory phase. It is responsible for the safe nidation of the ovum, it is antagonistic to estrin, and inhibits uterine contractions. Its use is indicated in certain forms of uterine bleeding, especially the puberal or maturity types. It is of undoubted value in cases of threatened and recurrent abortion, in which a physical cause cannot be found. The results are uncertain in those cases of dysmenorrhea which are due to excessive contractions.

Of the gonadotropic hormones, the following are available for therapeutic administration: (1) the pituitary-like substance (anterior lobe) found in the urine of pregnancy which is known to have a luteinizing effect on the immature ovaries of mice; (2) the follicle-stimulating hormone, found in the serum of pregnant mares and in the urine of menopausal women, shown to cause ovarian development and follicle formation in animals.

The first is theoretically indicated in cases in which the corpus-luteum hormone is considered to be deficient; for example, in repeated abortion, functional bleeding, and dysmenorrhea. It is indicated in functional amenorrhea, in sterility, and in all conditions of under-activity of the ovaries. Results have not as yet justified the hopes that were entertained for it.

The fourth described, the androgenic hormone, acts by inhibiting the gonadotropic activity of the anterior lobe of the pituitary gland. It is also antagonistic to estrogen. In large doses it is capable of producing temporary amenorrhea, and has been suggested for the severe cases of dysmenorrhea.

Before a decision is made to treat a case in which symptoms indicate a functional deficiency with

hormones, the author suggests that attempts be made to determine which particular hormone is at fault; only by such means can therapy be carried out in a rational manner. Urinary assays may be of some value, while in endometrial biopsy there is a means of determining the presence of a functioning corpus luteum. The examination of vaginal smears helps to determine the effectiveness of estrogen.

In considering the undesirable effects following hormone therapy, the author notes that since in practice it is rarely necessary to give large doses of estrogen for a very long time, the risk of the development of malignant disease is negligible. Apart from the development of malignant disease, prolonged administration of estrin may cause other harmful effects by inhibiting the gonadotropic activity of the pituitary gland. As a result of too high a dosage of estrin, there may be unexpected uterine bleedings, symptoms of headache and nausea, and even swellings of the hands, face, and eyes. It has been shown that wide fluctuation of the basal metabolic rate occurs from a single injection of 1,000 I.U. of estrogenic hormone. The author notes the importance of metabolic observations when giving large doses of estrin to patients suspected of incipient hyperthyroidism.

Successful results of hormone therapy in functional gynecological disorders are mainly those following substitution therapy, as in the menopausal state and conditions allied to it, in abortions, and in special types of uterine bleeding. The treatment of other endocrine disorders by such means is at present unsatisfactory. Especially is this true in the case of functional amenorrhea. The author believes that this unsatisfactory treatment is due to (1) the frequent absence of careful general examination of a patient in whom a menstrual disorder may be but a symptom of some general systemic disease, (2) the fact that, at present, we are unable to determine by biological assay the particular hormone at fault, and (3) the habit of ignoring a psychological cause. This may play a very important part in functional amenorrhea.

Research and advances in endocrine physiology and chemistry have far outstripped those in therapy. More discrimination should be shown in the choice of cases. Further scientific research may solve the present difficulties of successful endocrine therapy in the treatment of some functional disorders of women.

HERBERT F. THURSTON, M.D.

Kellar, R. J., and Sutherland, J. K.: Clinical Experiences with a New Synthetic Estrogen, "Stilboestrol" (Diethyl-Stilboestrol). *J. Obst. & Gynaec. Brit. Emp.*, 1939, 46: 1.

A series of cases of menopausal syndrome, senile vaginitis, leucoplakia vulvæ, inhibition of lactation, and secondary amenorrhea was treated with the synthetic drug diethylstilboestrol. This drug produced results more or less similar to those of a natural estrogen and was active when given by mouth.

CHARLES BARON, M.D.

Anker, H.: The Treatment of Menstrual Disturbances with Follicular Hormone (Menstruations-Stoerungen behandelt mit Follikelhormon). *Acta obst. et gynec. Scand.*, 1939, 19: 9.

The histological picture that is regularly found in juvenile menorrhagia (glandular hyperplasia of the endometrium) has been explained by an overproduction of follicular hormone with simultaneous insufficiency of the corpus-luteum hormone. "Cystic degeneration" of the ovaries with numerous unruptured follicle cysts has also been found when the corpus luteum did not develop. On the basis of this theory corpus-luteum therapy was instituted, but the results were not very encouraging and have not definitely shown that the absence of the corpus-luteum hormone is at fault. Prolan-B therapy is also not encouraging. Histologically, the picture of glandular hyperplasia shows a striking similarity to that of the secretory phase of the mucosa, namely, the presence of markedly tortuous glandular tubes that often are deeper and wider than normal and show the effect of corpus luteum. The question therefore arises whether it is correct to assume the absence of this hormone.

This concept, that the mucosa has been continuously influenced by the corpus luteum and is in the secretory phase, but that the shedding is not complete, and the bleeding originates from the blood-filled, swollen, partly shed, semi-necrotic mucosa, has led to the idea that it is the follicular hormone and its effect that are missing in the development of the newly proliferating mucosa. This also explains the deficient activity of the musculature paralyzed by the lutein, which contracts poorly around the bleeding blood vessels. Cases of juvenile menorrhagia often show genital infantilism—signs of insufficiency of the growth-producing effect of the follicular hormone upon the myometrium.

The author reports 7 cases of menorrhagia, including 6 of the juvenile type, that were treated with large doses of follicular hormone. Two patients developed a quite regular estrus, with hemorrhages of normal intensity and duration. Three others showed a decrease in intensity and duration of the bleedings, but not regular estrus, and an amenorrhea lasting several months before menstruation appeared. In 2 cases the menorrhagia continued but with slightly diminished intensity. One of these was not of the juvenile type. In view of the histological picture (glandular hyperplasia of the endometrium) observed in the curettings from 3 cases, it seems that this condition should be treated with follicular hormone and not with corpus-luteum hormone.

Of 5 patients with secondary amenorrhea or oligomenorrhea treated with follicular hormone or with combined follicular and corpus-luteum hormones, 3 reacted with hemorrhages, 2 showed improvement of the infantile symptoms, and 1 presented pregnancy after one year of normal married life. The hemorrhages appeared during or immediately after the end of the treatment with follicular hormone.

LOUIS NEUWELT, M.D.

Custo, E. L.: Behavior of Placental Tissue Transplanted in Parenchymatous Organs. Its Hemostatic and Hormonal Action (Comportamento del tessuto placentare trapiantato negli organi parenchimatosi. Sua azione emostatica e ormonale). *Folia demograph. gynaec.*, 1938, 35: 513.

The experiments of Custo consisted of heteroplastic, autoplastic, and homoplastic implantation of placenta in the liver, kidney, ovary, or uterus, or in 2 organs simultaneously, of rabbits and guinea pigs. The pieces of placenta used were not more than 3 or 4 mm. square and the animals were sacrificed to verify the fate of the graft after lapses of time varying from three to fifty days.

For the heteroplastic grafts in rabbits, woman's placenta was used. The bed of the graft was prepared by producing a lesion on the selected organs, in many cases by removing a small piece of tissue, and the graft was applied by simple compression not lasting more than one minute. In the animals killed three days after the intervention, the placental tissue showed rather marked signs of degeneration and no indications of proliferation or of infiltration of the organ to which it was applied. It was completely isolated from the organ by an accumulation of small cells present in the superficial layers of the organ. The liver, kidney, and ovary used did not show any changes, but the uterus was slightly enlarged. In the animals killed six days after the intervention, the parenchyma of the organs did not show any changes, but the graft, recognizable by its whitish color, appeared as if it were surrounded by a thin membrane on the kidney and the liver. The inflammatory reaction of the ovary did not seem to be as marked as it was in the other organs and the placental tissue was also less altered, as some syncytial cells were still distinguishable. After twelve days, the graft consisted of a small mass of whitish tissue of increased consistency and of decreased volume, surrounded by a capsule of young connective tissue. It was undergoing degeneration and was infiltrated with calcium. The parenchyma of the organs was normal. After twenty days, the calcium infiltration was still greater, and more advanced changes were noted after thirty and fifty days. At no time had there been any new formation or any tendency to ward vascular proliferation.

The same results were observed following autoplastic and homoplastic grafts of placenta in rabbits and guinea pigs examined at identical intervals of time. However, extravasation of blood was noted between the graft and the organ and some large elements were found in the leucocyte infiltration. By the twentieth or thirtieth day, degeneration of the placenta was nearly complete. Examination of the lungs did not reveal any metastatic inclusions of placental tissue.

Prompt hemostasis was observed in all except 2 cases after the graft was applied, and it was nearly instantaneous when woman's placental tissue was used: this action is probably mechanical. As to the hormonal action of the grafts, notable enlargement of the uterine horns was observed in 4 animals and was more marked in 3 of them which had received a graft of woman's placenta. This was due probably to the slow absorption of the folliculin contained in the disintegrating placental graft.

RICHARD KEMEL, M.D.

TERATOMATOUS CHORIO-EPITHELIOMA IN THE FEMALE AND IN THE MALE

A Critical Study of the Literature for the Years 1935, 1936, 1937

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Report of 2 Cases in the Male

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CHORIO-EPITHELIOMA is a rare and malignant neoplasm which arises from the epithelium of chorionic villi. It may develop at any site at which there are living chorionic cells; therefore, it may occur in teratomas of either the ovary or the testicle. Melot (25) says chorio-epithelioma can be the result of malignant evolution of embryomas arising especially in the testicle, rarely in the ovaries, the thyroid, the kidneys, the intestines, or the pancreas; and for this reason chorio-epithelioma has been observed in virgin women and in men. Marguerite Jaquenod (20) thinks that chorio-epithelioma in men and non-pregnant women can always be traced to a teratoma which need not of necessity be located in the sex glands. Preston and Gay (28) are sure that primary chorio-epithelioma of the ovary arises without any preceding pregnancy because it is of a teratomatous nature and its origin in the ovary is analogous to a similar lesion of the testicle.

In a most thorough and instructive paper on primary chorio-epithelioma of the ovary, Simard (31) sets forth the opinion that the origin of this neoplasm is still open to discussion. He summarizes the various theories which have been suggested in explanation of chorio-epithelioma of the ovary as follows: (1) malignant transformation in the ovary of chorioplacental cells, carried from the uterus or the tube following pregnancy; (2) malignant transformation in the ovary of trophoblastic elements following ovarian pregnancy; (3) ovarian metastases of primary chorio-epithelioma of the uterus or of the tube; and (4) malignant transformation of the trophoblast in ovarian parthenogenesis, as suggested by L. Loeb in 1911. Simard makes several interesting comments regarding Loeb's theory of malignant transformation of the trophoblast in ovarian parthenogenesis, and he quotes many authors in support of the theory of the parthenogenetic origin of primary chorio-epithelioma of the ovary. Thus the theory of the parthenogenetic origin of almost all the teratomas and the chorio-epitheliomas of the gonads is more and more generally accepted; that is, teratomas originate from parthenogenesis in the adult ovary, from androgenesis in the adult testicle, and from ephebogenesis in the gonads before puberty. From the ectoderm of the teratomatous ova, in the first state of their development, would arise the chorio-epitheliomata independent of normal fertilization. The parthenogenetic hypothesis seems to offer a better explanation of the benign or malignant forms of the majority of the dysembryomas. Simard's classification of dysembryomas arising from sex cells is reproduced in Figure 1. Schwarz and Freund (29) suggest the same 4 possibilities for primary chorio-epithelioma of the ovary.

According to Kirwin (22), Wlassow in 1900 "reported four cases of testicular tumor, and mentioned the striking resemblance which he had noted in two of them, to the chorio-epitheliomata seen in the uterus. Wlassow's work does not seem to have made much impression even in Europe. . . . Two years later, in 1902, Schlagenhaufer reported a further case, and made a careful and well correlated evaluation of all the pathological and structural data which had accumulated up to that time. The name he suggested was *malignant chorio-epithelioma of the testicle*. The appropriateness of this name he based upon his conclusion that the growth in question is genetically equivalent to the chorio-epithelioma seen in the female, and is originated in a teratoma."

Irvin Abell (1) considers chorio-epithelioma of the male as "among the 'believe it or nots' of medicine," and he remarks, "after believing for years that the tumor arose only as a pregnancy sequel its demonstration in the male afforded a

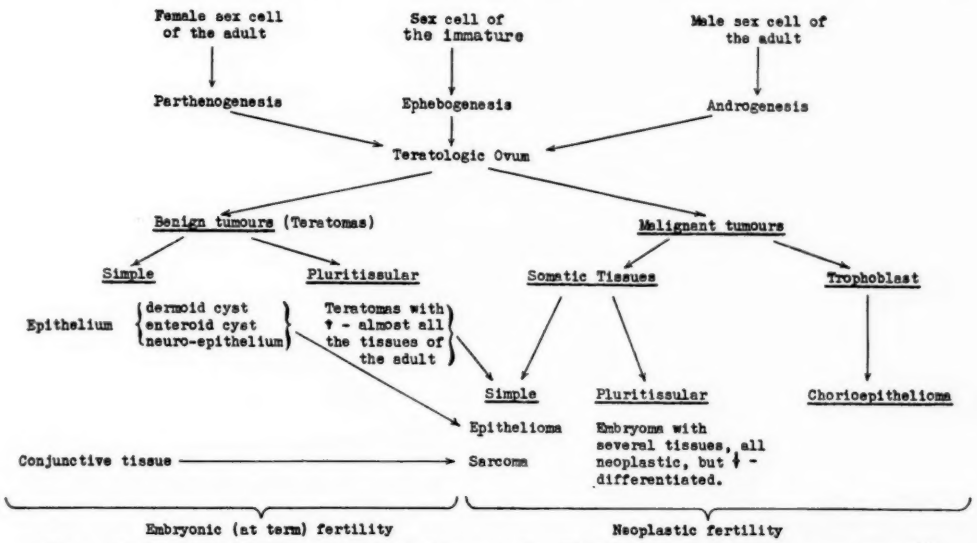

Fig. 1. Classification of dysembryomas arising from sex cells. (Simard, L. C.: Am. J. Cancer, 1937, 30: 298.)

paradoxical curiosity. Its mode of origin is still uncertain but is regarded as evidence of a metaplastic change in an embryonic ectodermic testicular structure which under certain unrecognized conditions is capable of producing this variety of tumor." Ogilvie and Mackenzie (26) aver that although a well recognized phenomenon, the appearance of chorio-epithelioma in the male is nevertheless a rarity, and its origin is traceable to chorionic epithelium which is an element in teratoma of the testis.

The conception that at least part of the group of teratomas arise from totipotent cells which have the inherent capacity to originate all the tissues of a new person appears logical to Dickson (6). He quotes Ewing as saying that an important principle of the growth of teratomas is the tendency of one element to overgrow and suppress the others. In teratoma of the testis, chorionic epithelium appears frequently to do this; in teratoma of the ovary it is almost unknown. Dickson accepts the premise that chorionic epithelium *per se* is malignant and that when it is present, the absence or occurrence of malignancy is determined solely by the presence or absence of a capacity for defense by the host. He states: "So far as is known chorionic epithelium in the male is invariably malignant. It has not been described as a benign constituent of teratomas in that sex. Ewing says that the adult tissues of teratomas give rise to benign growths and the embryonic tissues originate malignant growths. Obviously, the adult tissues develop from the embryonic. In the development of a teratoma from a totipotent cell, analogous to the development of the embryo, the embryonic tissues ordinarily should give rise to adult types. This cannot occur in the case of chorionic epithelium for it is a pure embryonic tissue and not destined to originate any adult type. Normally its destiny is to perform a definite function during gestation during which it is under control. It then dies. In the male its destiny is thwarted. Control is lacking. It exhibits, however, its physiological properties. The result apparently invariably is a malignant neoplasm. So we may say of chorionic epithelium: Physiologic and very rarely malignant in the female; accidental and invariably malignant in the male."

Callens (4) points out that the several theories of the genesis of chorio-epithelioma of the testicle have been abandoned in favor of the belief that this tumor originates from a fetal rest of the primordial "gonoblasts" by a process of parthenogenesis.

Gerber (14) explains that "Extragenital or ectopic chorio-epitheliomas in males are considered to develop from germinal rests or as malignant transformations of teratomas. The germinal rests or teratomas are most commonly found in the mediastinum or in the retroperitoneal region along the course of the urogenital anlage. The concept of the origin of chorio-epitheliomas from mis-

placed testicular rests has recently received additional support in the findings of Staemmler who reported the occurrence of such rests in the retroperitoneal fat at the root of the mesenteric vessels. He believes that they represent rests of the *plica urogenitale*. Inasmuch as the plica urogenitale extends from the sixth thoracic to the second sacral segment in the embryo, the author believes that germinal rests also may be found in the mediastinum in the adult."

In discussing chorio-epithelioma of the testicle, Entwisle and Hepp (8) mention the theory of Delafield and Prudden: "'These neoplasms are described in the older textbooks under the name cystoma or adenoma but are now suspected by many to arise from dissociated blastomeres. A blastomere is one of the cells resulting from the first few divisions of the fertilized ovum. The earliest are totipotent, since any of them can produce all the tissues of the body. Hence they differ from their descendants, which become gradually multipotent or able to evolve many tissues though not all, and finally unipotent, or capable of building but one. Teratomata of the testis are believed to arise at a time when the blastomere is totipotent, and these growths are, therefore, potentially tridermal, i.e., may contain derivatives of all three germinal layers. Now, since derivatives of all three layers are potentially present in a teratoma of the testis, the tumor, like a normal embryo, will tend to develop a chorion. Thus is explained the chorionepithelioma of the testis, a malignant and rapidly metastasizing neoplasm similar to that found in the female.'"

Hamdi (16) does not think that chorio-epithelioma of the testis need always arise from special germ cells but may originate in rare instances from any epithelial or undifferentiated mesenchyme cell. Gough (15) is of the opinion that since chorio-epithelioma of the testis metastasizes through the lymphatic system, a fundamental difference in type of tumor is suggested even though the cellular elements and the biological reactions may be indistinguishable from those present in the chorio-epithelioma which is associated with pregnancy and hydatidiform mole in the female.

The primary testicular tumor in their case, Friedlaender and Moses (13) report, was a teratomatous growth consisting of a chorio-epithelioma, a seminoma, an epidermoid cyst, and an epithelioma.

PRIMARY CHORIO-EPITHELIOMA OF THE OVARY

Primary chorio-epithelioma of the ovary is of particular interest because of its rarity and because its exact origin is still unknown. In this study reports of only 5 cases were found; about 15 are recorded in the entire literature.

Simard (31) reports 2 cases which showed unusual features, one in its structure and the other in its clinical manifestations. His first patient, a woman aged forty-two, gave a history of continuous uterine bleeding from June, 1929, to March, 1930, at which time the hemorrhage ceased and she became aware of a mass in her abdomen. There had been no history of pregnancy in the five years previous to this. A diagnosis of pedunculated fibroma of the left horn of the uterus was made. When the patient was operated upon a tumor of the left ovary was found, and a subtotal hysterectomy with bilateral salpingo-oophorectomy was performed. The ovarian tumor weighed 410 gm. and measured 16 by 10 by 9 cm. The histological diagnosis was chorio-epithelioma. Two weeks after discharge from the hospital the patient was bedridden with shortness of breath, persistent cough, pallor, and emaciation. A roentgenogram showed evidence of metastases in the lungs. The patient died two months after her operation. At autopsy it was observed that there were no evidences of recurrence or metastasis in the abdomen. The mucosa of the uterus and of the tubes showed no modification, and the pulmonary metastases were of the same histological structure as the primary tumor. There was absolutely no doubt about the diagnosis of chorio-epithelioma. A portion of the pathological study of this case is as follows: "One of the fragments is worthy of special mention. It is formed by ovarian stroma which is barely modified by the oedema and is bordered by the invading chorio-epithelioma. Many vessels of small caliber reveal around their endothelial lining a thick sheath made up of several layers of cells. These cells are large, and are round, oval, or club-shaped. Each cell is sheathed by a delicate collagen lining. Their cytoplasm, which is transparent, clear and acidophilic, contains fine granulations stained blue by phosphotungstic haematoxylin, and black by iron haematoxylin. The nucleus, swollen and lacking in chromatin, is oval and is located in the center of the protoplasm."

Simard assumes that decidual cells are formed from the connective-tissue cells of the ovary, or that these perivascular cells have the same significance as decidual cells. The fact is worthy of mention because never to his knowledge have such elements been described in relation to a primary ovarian chorio-epithelioma. Interest is augmented by the fact that this is likely to

throw light on the causality of decidual cells. In normal pregnancy decidual reaction has been attributed to several hormones: estrin, folliculin, the placental hormone. In his case this last hormone seems to have played a part since the tumor was formed exclusively of a pure culture of chorioplacental elements. It would seem then that the decidual cells in the ovary, which have been described, are attributable to the chorio-epithelioma, and it would follow that the decidual cells in normal pregnancy are attributable to a chorioplacental hormone.

Simard's second patient was a virgin seventeen years old with a tumor in the right lower quadrant. She was operated upon, and a mass which was attached to the right ovary and which was about the size of a baby's head was removed. The pathological report was chorio-epithelioma. At this time both the urine and a specimen of the tumor gave a strongly positive Aschheim-Zondek reaction. The patient made an uneventful recovery, but died four months later. No details as to the circumstances of her death could be obtained, and no autopsy was performed.

A small group of primary ectopic choriomas arise without any preceding pregnancy and are of teratomatous nature, their origin in the ovary being analogous to chorioma of the testis. Following this statement, Preston and Gay (28) report such a case. Their patient was a married, white female, aged twenty-two years, who complained of vaginal bleeding, pain in the lower abdomen, morning nausea and vomiting, and slight tenderness of the breasts without appreciable enlargement. Examination showed the breasts to be well developed and the areolæ pink. No secretion could be expressed from the nipples. In the posterior cul-de-sac there was a large, semisoft, slightly tender mass, apparently connected with the right tube and ovary, and almost completely obstructing the rectum. The Friedman test was positive. After a preliminary transfusion of blood, the patient was operated upon, and the tumor with the attached right tube was removed with difficulty. The right ovary was not identified. Both the left tube and the left ovary were normal. The histological diagnosis was "chorioma of the ovary." The Friedman test remained strongly positive. Three blood transfusions were given postoperatively, but twenty-one days after the operation the patient died. At autopsy metastases were noted in the lungs, the spleen, the liver, the wall of the ileum, and the kidneys. The left ovary showed no evidence of corpus luteum.

In the discussion of their case, Preston and Gay say that differential diagnosis was confused with ectopic pregnancy because of the history of morning nausea and vomiting and tender breasts which suggested pregnancy. They add that "while a routine Friedman test is of no value in differentiating chorioma from hydatidiform mole or pregnancy, a persistently positive test after removal of all gross tumor is valuable evidence that removal was actually incomplete." These authors conclude, "The case reported here brings up the academic question as to whether the tumor arose from the placental remnants of a pregnancy two years previous or as a teratoid tumor from the ovary. In assuming the former, one must consider the possibility that the remains of a pregnancy within the uterus disappeared. An undestroyed placental fragment transported to the region of the ovary may then have become malignant. Another possibility is that an ectopic pregnancy either in the tube or ovary may have terminated in a similar manner, the passage of clots being the result of the loosening of endometrial decidua. It seems unlikely that a tubal pregnancy could have ruptured or aborted and leave the tubes with no evidence of damage. Although an interval of two years between pregnancy and the appearance of tumor is unusual, a latent period of several years does not argue against the relationship between the two. The disappearance of primary uterine chorioma has been authentically reported (Novak and Koff) and may be applicable to the case reported here. The question as to whether the tumor was related to ovarian pregnancy or originated as a teratoma cannot be answered. The surgical specimen was subsequently reviewed in an effort to find teratomatous tissue other than chorioma, but without success. However, in the reported cases the chorionic elements of a teratoma had frequently so outgrown the other tissue that the latter were hard to find. It appears, therefore, that the case is one of primary chorioma of the ovary."

Schwarz and Freund (29) report the case of a twenty-six-year-old woman who died following removal of the uterus and adnexa for a primary chorio-epithelioma of the right ovary. A right nephrectomy, for what was thought to be a hypernephroma, had been performed previously. Histological study of the kidney tumor, which had been removed surgically, showed it to contain metastatic chorio-epithelioma. At autopsy, widespread metastases were observed in the lungs, the left kidney, the brain, and the eighth thoracic vertebra. In the left adrenal gland many of the arteries and veins of the cortex were filled with tumor thrombi. These thrombi showed no organization as yet and the infarcts appeared not to be

very old. In addition to these findings there was a macroscopic metastasis of chorio-epithelioma which was very hemorrhagic and showed extensive necrosis.

Teratomatous chorio-epithelioma of the ovary belongs, Fikentscher (10) says, to the rarities as far as the literature is concerned. In commenting on the histological structure of the tissue, he states that in these tumors the chorio-epitheliomatous portions are found in company with the most varied tissues, and he mentions the fact that a tumor which Klaften examined showed the structure of a granulosa-cell tumor in addition to the chorio-epitheliomatous elements. Fikentscher states further that at times the chorio-epitheliomatous structure in malignant teratomas is not seen in the primary tumor but in the metastases. For the diagnosis of this condition, he stresses the use of the biological pregnancy tests, especially those for the quantitative estimation of the chorionic gonadotropic hormone. He warns, however, that there are different causes which may lead to the finding of either a normal or lessened hormone content, stating that among these causes are early degeneration of the "hormone active" tissue, prevention of hormone secretion into the blood stream by fibrin barriers, and variable and different functional ability of such chorionic diseases which may appear to be microscopically alike.

In this connection he cites the names of various authors—Ehrhardt, Philipp, Ruzicska, Hajek and Bareuther, and Kawanobe. He also cites the work of K. Heim, who noted marked elevation of the hormone content in the so-called toxicosis of pregnancy, especially eclampsia and hyperemesis; and he emphasizes the fact that false conclusions might be derived from single estimations of the chorionic gonadotropic hormone because the hormone content in the urine of the same person undergoes variations which correspond to the changing concentration of the urine.

Fikentscher's patient was a fourteen-year-old girl who underwent removal of a fist-sized ovarian tumor. Histological examination showed a teratomatous chorio-epithelioma. Soon after the removal of the primary tumor, metastases developed throughout the entire body, and a short time later the patient died. During the time she was under treatment several quantitative estimations of the gonadotropic hormone in the urine were made according to Zondek's method. A positive test was procured with 0.005 c.cm. of urine, a dilution corresponding to 200,000 mouse units per liter of urine. A positive Aschheim-Zondek test was also obtained following the implantation of pieces of metastatic tissue from the liver. Fikentscher thinks that many of the unsolved problems of chorio-epithelioma, particularly of the site in which the gonadotropic hormone is formed, may be solved through the study of teratomatous chorio-epithelioma. He adds, however, that from the findings in his case, in which the hormone was present in the tumor tissue itself, he cannot decide whether the hormone is only stored in the tumor tissue or whether the tumor tissue actually produces the hormone. As an argument against the formation of chorionic gonadotropic hormone by the anterior lobe of the pituitary gland, Fikentscher cites the work of Philipp who obtained positive Aschheim-Zondek tests with the urine of young children who had chorio-epithelial tumors. This is especially important since it is known that the anterior lobe of the pituitary gland of such children does not contain a hormone which gives rise to the pregnancy reaction.

Comment. Primary chorio-epithelioma of the ovary is so rare that its very existence is questioned, and there is much disagreement as to its origin. All of the 5 patients in this study had extensive metastases. The symptoms in each instance were of long duration, and their nature was not known. Most of the cases were misdiagnosed until after operation; hence treatment was of no avail. All of the patients died. The difficulties of diagnosis are obvious, and it appears that only by a lucky diagnostic stroke and early operation can any patient with primary chorio-epithelioma of the ovary be cured. Every case encountered should be thoroughly reported.

PRIMARY CHORIO-EPITHELIOMA OF THE TESTICLE

For many years chorio-epithelioma of the female generative organs has been a recognized entity. That histologically identical growths are to be found in the male is a discovery of comparatively recent times (Kirwin, 22). While not so rare as primary chorio-epithelioma of the ovary, this type of growth in the male, occurring primarily in the testicle, is seldom seen. In this study 31 cases were found, including the 2 herein reported by Dr. Robertson, and it appears that 200 would cover the total number of cases recorded so far in the entire literature. According to Kirwin (22), Ferguson at the Memorial Hospital in New York found 6 chorio-epitheliomas in a series of more than 400 cases of testicular tumor. In the last ten years Juengling (21) saw 2 chorio-epitheliomas in 21 cases of malignant testicular tumors. He states that Desjardins, Squire, and Morton of the Mayo Clinic saw only 1 chorio-epithelioma in 101 malignant testicular tumors;

that Keller saw 2 in 30 malignant testicular tumors; and that Mackenzie saw 1 in 13 cases. He further states that Heidrich, Fels, and Mathias estimated the number of cases published in the world literature to be about 140 up to 1930.

Most authors accept the hypothesis that chorio-epithelioma testis represents the malignant growth of the chorionic tissue which is a part of teratomas. A few, however, have difficulty in accepting this theory. For example, Fortner and Owen (12) doubt whether males may have a structure with the morphological value of an included ovum which in turn may possess trophoblastic tissue. They cite Bostroem as believing that these tumors in the male might arise from undifferentiated germ cells (serotinal wandering cells), which, being affected by humoral influence, proliferate to form primary tumor cells. These authors also state, "Frank has regarded the formation of chorionepitheliomatous tissue in the male merely as evidence of a metaplastic change in an embryonal ectodermic structure which, under certain unrecognized conditions, is capable of producing this variety of tumor tissue, just as in response to other stimuli these tissues may undergo carcinomatous changes." Fortner and Owen are of the opinion that it would be difficult to explain embryologically primary chorio-epithelioma above the diaphragm since this structure is said to arise from the fifth cervical segment, while the urogenital ridge is believed to arise from the sixth cervical segment.

Kirwin (22) is partial to the theory, presented by Schlagenhaufer in 1902, that chorio-epithelioma of the testicle is genetically equivalent to the chorio-epithelioma seen in the female and is originated in a teratoma. Notwithstanding the fact that these assumptions have been assailed by Pick and Robert T. Frank, and more recently by French and American authors, Schlagenhaufer's conclusions, Kirwin says, still stand. Kirwin cites the excellent summary of those oppositions which René Jeanneret made a few years ago: "(1) One side claims that true fetal membranes have never been positively identified in a testicular teratoma. Yet we have known for a long time that elements of chorional ectoderm are observed with relative frequency in mixed tumors of the testicle. (2) The question has been asked: If there are fetal membranes in teratomas, why do they not sometimes develop into benign growths such as hydatidiform moles, instead of regularly producing chorionepithelioma, which is a malignant tumor? In reply to this it may be stated that at least five cases of hydatidiform moles in the male have been reported, but none are sufficiently well authenticated to offer conclusive proof."

To add to the argument, Bankoff (2) states that chorio-epithelioma in males is usually localized in the testicles or in testicular teratomas, and that the extragenital localization is probably only apparent or at least extremely rare. He further states that the histological aspects of the chorio-epithelioma in males correspond morphologically with those of the chorio-epithelioma in women, and that in its behavior toward the general organism, the chorio-epithelioma of males likewise resembles that of women. However, he doubts whether this similarity is proof that these tumors are of the same type, since it is known that tumors with the same histological aspects may be of different origin. In support of the hypothesis that chorio-epitheliomas are of different nature in men and women, the following characteristics are cited: The teratomatous chorio-epithelioma occurs only in men and always in the testicles; the entire tumor is of a malignant nature and free from benign elements; in contradistinction to the tumors in women, the metastases of the chorio-epithelioma in men appear almost exclusively in the retroperitoneal lymph nodes; combinations of chorio-epithelioma with other types of testicular tumors as well as a direct transition of chorio-epithelioma-like structures into adenocarcinomatous proliferations are demonstrable only in men. The author arrives at the hypothesis that chorio-epithelioma originates like all other testicular tumors in the testicular parenchyma. Its anatomical structure proves to a certain extent that its syncytial cells originate from Sertoli's cells.

Comment. While the argument as to the identity of teratomatous chorio-epithelioma is not settled, it would seem that a "clincher" in favor of the theory of chorionic origin is the fact that men who have such tumors excrete excessive amounts of the chorionic gonadotropic hormone and frequently show pregnancy changes, such as excessive nausea and vomiting and gynecomastia.

Kirwin (22) quotes Jean Callens who in February 1935 said, "Chorio-epithelioma of the testicle, that curious, essentially feminine tumor of the male sex gland, after having for a long time tested the sagacity of anatomo-pathologists, has now returned to the limelight since the perfecting of the various pregnancy reactions. . . . Biology has now shown us, thanks to the discovery of the pregnancy reactions of Aschheim and Zondek, that we have to do with a true ovum, composed of all its membranes. Could a more convincing proof of the reality of chorio-epithelioma be

brought forward than is done by these reactions, wherein its identity is verified by its own secretions? To deny the identity of the hormone would be to deny the existence of the evidence itself." In considering the questions which arise when the histogenesis of this entity is studied, Kirwin concludes, "Answers to these questions have been diligently sought, but the situation none the less remains very complex. There is hardly a subject in the realm of urology which is so hard to comprehend intelligently. The rarity of the growths, and the difficulties of proper classification when found, only make it the more important that we recognize chorio-epitheliomata when we encounter them."

Dickson (6) offers a very interesting discussion relative to the genesis of these tumors when he says, "For years there has existed a belief that malignant neoplasia is analogous to the growth of embryonic tissue. It has not been stressed, however, that we have in chorio-epithelioma a well known tumor which is actually composed of embryonic tissue from one individual growing in the body of another. Normal chorionic epithelium has properties which in any other situation would signify malignancy. It invades the wall of the uterus, erodes its blood vessels and at times forms emboli in the maternal blood stream. These features support the embryonic theory of tumor genesis. They have been well described elsewhere: 'Normal chorionic syncytium and cancer cells have much in common: extraordinary reproductive energy, rapidity of growth, invasive power coupled with destruction of the recipient tissue, and striking facility for hematogenous dissemination. When chorionic syncytial giant cells lodge in the lung, as they do with every childbirth, they soon die; but when carcinoma cell emboli lodge in the lung, they survive and grow only too frequently. One succumbs, apparently, to an anti-syncytial hormone; against the other no such defensive mechanism seems to be at hand.'"

Mediastinal tumors. In a few reported cases teratomatous elements were found in a primary mediastinal tumor. While some of these are doubtful, and while they are rare, those in question gave no evidence that the tumor had arisen from the genital tract. There might be two explanations for the presence of a primary growth in the mediastinum: the one, that there really had been a primary growth in the testicle which through necrosis became obliterated; the other, the concept of Staemmler quoted by Gerber (14), that these primary mediastinal growths might take place from misplaced testicular rests of the plica urogenitale (genital ridge), which extends from the sixth thoracic to the second sacral segment in the embryo. (There is a difference of opinion among embryologists as to the relationship of the origin of the diaphragm and the genital ridge. Some believe, however, that genital rests at times migrate upward and above the diaphragm from the cloacal region.)

Pathology. Very little has been written on the pathology of chorio-epithelioma in the male. A few papers, such as that of MacDonald (24) concerning chorio-epithelioma of the choroid, refer to specialized pathology. MacDonald reports as follows the microscopic examination of the autopsy material which presented the characteristics of typical chorio-epithelioma: "Large necrotic and hemorrhagic areas were present, surrounded by a rim of living tumor tissue. The cells were of two types: polyhedral cells with a vesicular nucleus, which tended to grow in sheets and cords, and syncytial masses of protoplasm having several large dark-staining nuclei. These masses of syncytial cells tended to outline spaces containing red blood cells and showed marked invasive qualities. Sections from the breast showed hypertrophy of the glands, the acini containing a pinkish-staining hyaline secretion." Fortner and Owen (12), who had 2 cases, comment that "Sections from the primary tumors and metastatic nodules in both these cases disclosed typical characteristics of chorionepithelioma. In addition to the syncytial masses dipping into large areas filled with red blood cells, some strands appeared to have central connective-tissue cores with capillaries, thus resembling chorionic villi." In discussing his case, Gerber (14) says "The tumor had no distinct capsule. It was cellular and had extensive areas of hemorrhage and necrosis. The tumor cells consisted of two distinct types. One type resembled the Langhans cells of normal placental tissue. The cells were large, polyhedral in shape and were grouped in broad nests or plaques. Their cytoplasm was basophilic, abundant and vacuolated; their nuclei were large. Occasional mitoses were present. The other type of cells found along the margins of the broad cell nests resembled the syncytial wandering cells of pregnancy. They were large, irregular, often angulated and possessed an abundant acidophilic cytoplasm with multiple large hyperchromatic nuclei. Mitoses were also seen frequently. No cilia were present in these cells. Careful search of the tumor sections revealed no teratomatous elements. The metastatic nodules in the lungs, liver, spleen and kidneys presented a similar histologic appearance." In their case, Craver and Stewart (5)

state that histologically the main tumor, which was in the thorax, proved to be a classical chorio-carcinoma, as were the metastases. "Both testes were completely atrophic. Very rare degenerated nonfunctional testicular tubules were found in the midst of a generalized bilateral diffuse overgrowth of large interstitial cells. The two distinct nodules described in the left testis were of great interest. The upper one consisted of a cyst lined by sloughing stratified squamous epithelium as in a cholesteatoma. The very small mucoid area proved to be an adult-looking branching mucous gland with fully developed ducts. No evidence of other teratoid structure was found."

Pituitary gland. The histological examination of the pituitary gland in chorio-epithelioma should be of considerable interest. In this survey there are several reports in which such examinations are mentioned. For example, Juengling (21) states that in the hypophysis of one of his patients signs of pregnancy were noted. Sections of the pituitary gland from Entwisle and Hepp's (8) patient showed a large preponderance of chromophobe cells, hyperplasia of basophils, and a few eosinophils. They explain that the swollen chromophobe cells are called cells of pregnancy. In his report, Herlant (17) makes the note that the hypophysis had assumed the character associated with normal pregnancy. MacDonald (24) records the finding of marked changes in the pituitary gland of his patient. "The pituitary body of their patient," Friedlaender and Moses (13) relate, "showed the typical changes which are a result of pregnancy; namely, a distinct increase of mother cells, a reduction of the eosinophils, and a great increase in the basophilic elements." On the other hand, Craver and Stewart (5) state that grossly and microscopically the pituitary gland was normal in their patient.

Metastases. In most of the cases reported, metastases were already present when the patient came for treatment. This, no doubt, was due to the fact that the disease had reached a certain stage of advancement, and this probably accounts for the terrific death rate. Lung metastases are the most common, and their presence is a very grave prognostic sign. Juengling (21) says that the early presence of extensive coin-shaped pulmonary metastases is a point against the diagnosis of seminoma and one in favor of chorio-epithelioma. In contrast to chorio-epithelioma in the female, the course of this condition in the male is usually stormy and fulminating, and there is early metastasis to the lungs. He contrasts seminomas with chorio-epitheliomas with regard to their characteristics and the success in their treatment. Craver and Stewart (5) describe a case of chorio-epitheliomatous metastases from a small tumor of the testis which had undergone complete local healing by sclerosis, and they state that this once more raises questions of interpretation in reports of extragenital choriocarcinoma. Both lungs in his patient, Gerber (14) says, were studded with tumor nodules, and nodules were also present in the liver, the kidneys, and the spleen. No gross connection, however, could be found between the tumor and any part of the genital tract. Among other metastases, a large detachment caused by a mass that was solid in appearance was seen in the upper and outer part of the retina in the right eye of his patient, MacDonald (24) reports. This case was one of chorio-epithelioma of the choroid.

Symptoms and diagnosis. The paucity of cases reported makes it difficult to elaborate on symptoms and diagnosis. Many of the patients were seen first with lung symptoms, such as dyspnea and pain in the chest (5, 21), and hemoptysis (15, 21, 24, 38). Some patients had pelvic or abdominal tumors (14, 32). In one instance fatigue was an outstanding symptom, and one patient had epigastric pain (32). In some cases the diagnosis was made with roentgen rays. For example, Craver and Stewart (5) and Gerber (14) report the finding of a large mediastinal mass by means of the roentgen rays, while Fortner and Owen (12) record the finding of metastases in both lungs in this manner. Kirwin (22) states he noted marked enlargement of the bronchial and cervical lymph nodes by means of the roentgen rays.

Gynecomastia and pregnancy symptoms. Among the outstanding and very interesting changes observed in men harboring chorio-epithelioma is gynecomastia. Symptoms which might be associated with pregnancy are also noted in these patients. For example, MacDonald (24) reports the observation of enlargement of the breasts, female distribution of pubic hair, and linea nigra in his patient. In the report of their case, Entwisle and Hepp (8) write, "Both breasts were enlarged and tender, were slightly red and a few drops of colostrum could be expressed from each side." Fortner and Owen (12) report that one of their patients had prominent, firm, and disc-shaped nipple regions, measuring about 5 cm. in diameter, and the other patient had slightly enlarged breasts. They report further, "Sections through the mammary glands presented an increase in the number of acini, with an increased amount of fibrous tissue between them. The acini were moderately dilated and displayed evi-

dence of activity." Kirwin (22) calls attention to the breast changes which were emphasized for the first time by Cooke in 1915 and which had already been noted by Warthin and Garbarini. He mentions the fact that Cooke's patient, as well as the 2 other patients, had noticeable enlargement of the breasts and secretion of colostrum-like fluid. "These mammary evidences," Kirwin explains, "gave strong confirmatory support to the unsettled question of the relation of these tumors to the chorio-epitheliomata of the uterus long familiar to pathologists." He adds further that in Warthin's patient the hyperplasia of the breast decreased after the removal of the tumor from the testicle. Kirwin also cites Ross who speaks of enlargement of the breasts as a late manifestation. Melot (25) quotes Laetsch and Arendt as having observed gynecomastia and even secretion of the colostric type in male carriers of chorio-epithelioma. Truc (36) reports the case of a patient who had such a tumor and showed breast changes. Dickson (6) mentions gynecomastia, at times with secretion of colostrum, as one of the symptoms. Callens (4) and Videla, Vivoli, and Rey (38) also report the presence of gynecomastia in their patients. In fact, Callens believes that the association of gynecomastia with a testicular tumor and a pregnancy reaction in the urine will make the diagnosis of chorio-epithelioma unquestionable. Truc and Guibert (37) say that in their patient the gynecomastic syndrome did not disappear after castration, which indicated the gravity of the prognosis. Juengling (21) speaks of gynecomastia as a prominent symptom, and reports that one of his patients had fibromatosis of both breasts and that the breast gland of the other patient was in a stage of tubular overdevelopment with an increase of the stroma. One of his patients also had uncontrollable vomiting. Friedlaender and Moses (13) state that the breasts of their patient showed distinctly abnormal development with colostrum-like secretion. As a further pregnancy sign, these authors mention the fact that their patient suffered from almost uncontrollable vomiting, analogous to hyperemesis, which they attribute to the flooding of the body with gonadotropic hormone. Upon histological examination they found that the glands of the nipples were enlarged and showed extensive budding. Brews (3) reports nausea and vomiting.

Entwisle and Hepp (8), Brews (3), and Gerber (14) report that their patients gave a history of injury to the testicle. Several authors, however, including Fortner and Owen (12) refer to the painless character of the testicular growth.

Testicular growths. By far the majority of patients has a growth in the testicle. Sometimes the growth causes considerable enlargement of the testicle; at times it is not observed on a casual examination because it is so small, and is found only after a thorough search or after section of the testicle. Juengling (21) emphasizes the fact that the primary growth in the testicle can be very small, and hence make the diagnosis difficult. Ogilvie and Mackenzie (26) contend that the nodule in the testis may be so small as to cause no apparent enlargement. Smith (32) states that the growth his patient had was the size of a small pea and was located at the lower pole of the right testicle. In their case, Entwisle and Hepp (8) report, "There was a very small, hard, nontender nodule in the upper pole of the left testicle which was about half the size of a lima bean. It was quite difficult to tell whether this was actually in the testicle or whether it was an indurated portion of the epididymis." Craver and Stewart (5) say that the tumorous growth in the testis of their patient was not located until an autopsy was performed. They add, "Both testes were small, very firm and atrophic. No tubules could be seen. The seminal vesicles were atrophic, the prostate was normal. The right testis was of homogeneous color and consistency throughout. In the left testis, similar in all other respects to the right, were two small nodules. The upper of the two, situated near the rete, was a small whitish cyst 3 mm. in diameter. The lower, about 1 cm. removed from the former, appeared like a small focus of mucinous tissue not more than a millimeter in diameter. After hardening, the entire testis was cut in serial slices with a razor and nothing else suggestive of a primary tumor could be found. Search was made for pin-point hemorrhagic areas or foci of pigment but without avail." These authors state further, "One is therefore probably justified in assuming that in the early stage of the teratoma a choriocarcinomatous portion reached the systemic circulation with fatal results, whereas any residue in the testis disappeared probably through hemorrhagic necrosis. The remainder of the primary tumor remained quiescent in the form of a small cholesteatomatous cyst and a minute area of adult mucous glands." Kirwin (22) reports that his patient had a "mass in the right side of the scrotum. There was no pain. Upon examination the distended scrotum transmitted light, but in a manner so peculiar that to the diagnosis of hydrocele was added the possibility of neoplasm." In one of his cases Brews (3) speaks of swelling of the right testicle, and in his other case he mentions the fact that at

autopsy a small teratoma was found in the center of the right testis. In his report, MacDonald (24) states, "The left testicle was enlarged to the size of an orange. It was smooth and soft and did not fluctuate, it was painless on pressure, did not transmit light and was unattached to the surrounding structures." Jalet (19) says that the left testicle of his patient was hard and enlarged. Truc and Guibert (37) write that the left testicle of their patient, was enlarged but not painful. Fortner and Owen (12) make the following note in 1 case: "Examination revealed a tense enlargement of the scrotum with a hydrocele on the right. Large tortuous veins were present, some the size of an ordinary lead pencil. The left testicle was palpable, but no structures were outlined on the right until about 350 c.c. of amber-colored fluid were removed, when all the structures were found to be involved in a hard, nodular mass of tumor tissue." In their second case they make the note, "the left scrotal sac contained a tumor mass about 10 x 8 x 6 cm."

In other cases it is reported that the tumor did not appear to be in the testicle but either in the abdomen or in the mediastinum. Such a case is reported by Jaquenod (20). Her patient had a retroperitoneal tumor the size of a child's head, which she thinks developed from a teratoma situated in front of the aorta. Ogilvie and Mackenzie (26) describe a retroperitoneal growth with many metastases. Symeonidis (35) reports a case of retroperitoneal tumor which proved to be a chorio-epithelioma. He states that he found a small amount of atrophic, completely developed testicular tumor at the periphery of the abdominal growth, and he assumes that the lesion was due to a teratoma of an accessory, abdominally retained testis with predominance of chorio-epitheliomatous elements. Gerber (14) says that in his patient, "A firm, slightly tender, irregular mass about the size of an orange was palpated in the right lower quadrant of the abdomen just above Poupart's ligament. The genitalia were negative." In 1 case, Brews (3) reports "many lumps" could be palpated in the abdomen. Lévi-Valensi, Montpellier, Debrie, and Bartholi (23) state that they made the diagnosis in their case from a biopsy of a subclavicular nodule.

Biological pregnancy tests. The fact that these tumors in the male produce enormous quantities of chorionic gonadotropic hormone, which is found in all tissues of the body (in the urine, in the blood, in the spinal fluid, and even in the contents of cysts), has practically "upset the apple cart" of those who do not believe in the chorionic origin theory of these tumors. As witnessed by most authors, not only is the biological pregnancy test positive in cases of these tumors, but an enormous quantity of the chorionic gonadotropic hormone appears to be excreted. Practically all authors have used the pregnancy test in its qualitative phase as a diagnostic aid, and many have used it quantitatively, not only by means of the Aschheim-Zondek method but also by the Brindeau-Hinglais method with the rabbit.

Zondek (39) remarks as follows: "Also in chorionepithelioma of men, assay for gonadotropic substance is of importance, particularly in mixed testicular tumors. In a lecture at the Viennese Biologic Society (April 15, 1929) I pointed out, with reference to the strongly increased excretion of gonadotropic principle in the chorionepithelioma of women: 'It will be very interesting to examine the urine of men suffering from a chorionepithelioma, in order to determine the biologic identity of these epitheliomas.' Some weeks later (May 1929) I was in a position to examine a case of malignant testicular tumor; a greatly increased excretion of the hormone was detected (both follicle-stimulating and luteinizing factors). This was a mixed tumor with chorion-epitheliomatous elements. The biologic identity of these epitheliomas in men and women is now established. By assay of the tumor material (implantation or, still better, extraction) evidence may be derived as to the nature of the tumor. Thus I did not find any gonadotropic substance in the tumor tissue in a dysgerminoma, but it was present in the chorionepitheliomatous areas in large quantities. One can also get some idea of the malignancy of a particular tumor by means of these assay methods: hormonic tissue diagnosis and hormonic urine analysis. The latter seems to me to be confirmed by the investigations of Ferguson. I am, however, skeptical whether the anatomic structure of a tumor can be ascertained by the hormone excretion as accurately as Ferguson appears to believe."

Fluhmann (11) writes, "The presence of a gonadotropic principle in the urine of men with teratomas of the testicle was first reported by Zondek and has received abundant confirmation from Ferguson and others. It also has been recently shown that this substance has the biologic properties of the chorionic and not of the anterior hypophyseal hormone (Fluhmann and Hoffmann, Evans). The test in such cases is of value in the differential diagnosis of testicular tumors and may be employed to determine the effectiveness of operative or irradiation therapy and the appearance of metastases following the eradication of the primary tumor. In a recent communication,

Hamburger maintains that in addition to the group of new growths which produce the chorionic hormone, seminomas of the testis may also cause the appearance of a gonadotropic factor which has the characteristics of the anterior lobe follicle-stimulating hormone."

Juengling (21) emphasizes the use of the biological pregnancy tests. He knows of no negative Aschheim-Zondek reaction in the presence of chorio-epithelioma. Callens (4) says the Aschheim-Zondek test is of value in establishing the diagnosis and in making a prognosis. Ehrhardt (7) feels it is a serious omission to neglect urinary assay for the gonadotropic hormone in a man with symptoms pointing to the testis. A persistently negative reaction after the extirpation of such a tumor is a good augury, whereas the return of a positive reaction is a sure sign of recurrence. Kirwin (22) quotes Ferguson as having recently stated in a personal communication, "The differentiation of the chorionepithelioma from the remaining malignant tumors of the testes by means of assay of the urine for prolan is clear cut. No other tumor causes the excretion of the large amount as in the chorionepithelioma. In no true case has the excretion been less than 100,000 units per liter of urine." Gerber (14) reports a positive Aschheim-Zondek reaction in high dilutions of urine which was obtained at autopsy. Friedlaender and Moses (13) are of the opinion that in all cases of questionable testicular tumor it is advisable to do an Aschheim-Zondek test. Fortner and Owen (12) say that normal male urine contains less than 50 mouse units of prolan per liter. It is apparent that the increased amount of the hormone, from 10,000 to 150,000 mouse units per liter, offers an index of diagnostic value. Truc and Guibert (37) report that they made a quantitative analysis (Brouha-Hinglais method using the rabbit) and got a positive reaction with a single injection of .15 c.cm. of urine. They add that they also obtained a positive gonadotropic-hormone reaction with the fluid from the hydrocele which was associated with the chorio-epithelioma of the testicle in their patient. Smith (32) was so impressed by his success with the Aschheim-Zondek test in the diagnosis of pregnancy and tumors of chorionic origin, that he thinks it should be used more frequently in medical diagnosis. His 2 patients came under his observation for complaints which indicated ordinary medical illnesses, and it was not until the Aschheim-Zondek tests were found to be positive that the true nature of the illnesses was elucidated. He strongly advises the use of the Aschheim-Zondek test in all special examinations of the testicles and in examinations of all males showing retroperitoneal glandular enlargement.

Ewald (9) states that he obtained a positive Aschheim-Zondek reaction with 2.5 c.cm. of cerebrospinal fluid from a man with chorio-epithelioma. He thinks that his method might enrich our diagnostic acumen. Smith and Smith (34) mention the cases of 3 men who had chorio-epithelioma. They found a very high concentration of the hormone like that found in the anterior pituitary lobe in the blood and urine of these patients and an estrin content so low that it was not demonstrable without concentration of the specimens by extraction. Their data indicate "that the chorionic cells themselves, when they become neoplastic, do not contain oestrin in amounts comparable with those in the normal placenta."

Treatment. Treatment of chorio-epithelioma in the male seems almost as hopeless as that of teratomatous chorio-epithelioma in the female. Fortner and Owen (12) think that since these tumors consist of anaplastic and undifferentiated tissue they may be expected to be highly radiosensitive, and once a diagnosis has been made, pre-operative irradiation may be followed by radical removal of the primary site. For metastatic areas, they feel irradiation is at present the method of choice. Juengling (21) is skeptical about roentgen-ray treatment. He says that as far as he knows, only 1 case has been treated successfully with roentgen rays. In his cases the growths were completely refractory to roentgen rays. He believes that some of the reported cures by this treatment were in cases of seminoma and not chorio-epithelioma, because seminomas are known for their radiosensitivity and radiorefractory seminomas are undoubtedly rare. Entwisle and Hepp (8) report that they removed the testicle of their patient under local anesthesia and applied high-voltage roentgen therapy to the known involved areas, none of which changed in appearance or size. Kirwin (22) states that he performed an orchidectomy on his patient, and after the pathologist reported malignancy, applied deep roentgen therapy to the scrotum on the site of the growth. Truc and Guibert (37) say that they did an orchidectomy under local anesthesia on their patient. In questionable cases, Callens (4) suggests biopsy followed by immediate orchidectomy if the lesion proves malignant, but he feels that in spite of operative treatment the prognosis is usually hopeless. Several authors—Symeonidis (35), Smith (32), Jaquenod (20)—state that they performed exploratory operations, made a diagnosis, and closed the abdomen because the condition was inoperable. MacDonald

(24) reports that he enucleated an eye of his patient to relieve pain caused by a metastatic growth, and then treated the patient with roentgen rays. In an attempt at palliation, Craver and Stewart (5) say that they applied high-voltage roentgen therapy for lesions of the lungs which their patient had. The patient, however, died. On the other hand, Gerber (14), Videla, Vivoli, and Rey (38), Friedlaender and Moses (13), and Brews (3), in 2 instances, report that death of their patients was caused by cachexia and that diagnosis was made at autopsy. No roentgen therapy was used or operation done in these cases. In several papers and abstracts, which were studied relative to chorio-epithelioma of the testis, no mention was made of treatment.

In this study reports of only 2 cures of chorio-epithelioma in the male were found. One case was reported by Bankoff (2) and the other by Smith (33).

Lytic substance. Juengling (21) discourses considerably on the difference between the effects of chorio-epithelioma in the female and in the male. He thinks that metastases in the female are less important than those in the male because of a difference in biological attitude. This difference in biological attitude between the male and the female, he contends, is comprehensible if one realizes that chorionic villi grow physiologically into the blood vascular system during every pregnancy. It is highly probable that some of these chorionic villi are frequently torn off, carried elsewhere, and, in the female, destroyed by the body. The various possible phases from the hydatidiform mole to relative benignancy indicate the resistance of the female organism against this "germ" which is relatively characteristic of this sex. On the other hand, Juengling continues, chorio-epitheliomatous tissue is something definitely foreign to the male organisms, and one gets the impression from observations in the literature that the male organism is completely defenseless against the dissemination of chorionic tissue by way of the blood stream. He thinks that therapeutic measures are unsuccessful because the support by the defense mechanism of the body is lacking.

There is, however, a suggestion in the literature that some lytic substance might possibly be evolved as a cure. Sensing the possibility, and hoping that the ultimate treatment of chorio-epithelioma will be by means of a lytic substance, obtained probably from the post-partum woman, Fortner and Owen (12) postulate, "The trophoblast is known to be normally an invasive type of tissue and chorionic cells are reputed to possess the property of digesting the maternal tissue. The embedding of the ovum is thought to be accomplished by the aid of this characteristic. The cells of the trophoblast are naturally endowed with great capacity for growth. Schmorl has reported trophoblastic emboli in 80 per cent of women during normal pregnancies. This parasitic tissue then is able physiologically to invade and wander. Blair Bell offers the opinion that chorionic epithelium, more particularly the syncytium, is originally of a malignant nature, although after a few weeks it comes naturally under the influence of the developing fetus and its growth is arrested at a stage where it becomes subservient to the dependent embryo. Support for this theory exists in the work of Fraenkel who demonstrated that the serum of normal pregnant women is lytic to chorionic epithelium while the serum of women with chorionepithelioma lacks this property. . . . There is a possibility that treatment of these tumors may eventually be non-surgical, consisting in serum injections or endocrine therapy. In view of the observations made by Fraenkel it would seem that serum from pregnant animals holds promise of being beneficial. Such sera are now being utilized but it is too early to expect accurate findings. The very infrequency of chorion-epithelioma testis will delay for some time an adequate report on this method of therapy, although results in chorionepithelioma in the female should be reported at an early date. Due to the close association of teratoma testis with chorion-epithelioma, as evidenced by their endocrine relationship, it might be expected that the lytic agents occurring in pregnancy sera would also affect the teratomas."

Dickson (6), in a most interesting paper, suggests that serum from the female in the puerperium be given a therapeutic trial in the treatment of chorio-epithelioma. "The conception that chorionic epithelium per se is malignant seems reasonable," he argues. "It is not unreasonable to postulate that, having been exposed normally through the ages to the possibility of malignant growth of chorionic epithelium, woman possesses an inherent capacity to combat such a development; that given the presence of this epithelium, the absence or occurrence of malignancy is determined solely by the presence or absence of a capacity for defense by the host." He points out, "The idea of a hormone or antibody control of normal chorionic epithelium is not new," and he quotes MacCallum as saying that the complete disappearance of definite chorionic epitheliomas led Fleischmann (1905) to speculate as to "Whether there is some substance formed in the maternal blood at the end of preg-

Fig. 2. Case 1. Photograph taken at autopsy showing emaciation, mild gynecomastia, and filling in of jugular notch by diffuse colloid goiter.

nancy, which, like the experimentally produced syncytiolysin of Scholten and Veit, has the function of destroying the syncytial elements which remain buried in the uterine wall or lodge in distant organs. The failure of this substance might allow the unchecked development of the tissue into a destructive tumor, while its late formation might account for the disappearance of the tumor." Dickson adds, "Kaufmann states that in pregnancy normal deported cells and villi are destroyed probably by cytolysins in the sense of Ehrlich and that it is believed that when such antibodies are wanting, the circumstances favor a rapid overgrowth or the formation of a malignant chorion epithelioma. He quotes Schmauch as believing that successful therapy of this tumor may be practiced by immunization against its specific cells." Dickson maintains, "If the conception of a maternal hormone or antibody control of chorionic epithelium is correct, serum from the female in the puerperium and possibly also in the latter part of pregnancy when administered to one suffering with chorio-epithelioma might exert a retarding influence on the process." He recommends that selected patients with hopeless chorio-epithelioma be treated by the intravenous administration of large doses of serum from the human female taken at various stages of the puerperium. If the reaction should be favorable he would advise the use of serum from one of the lower animals, such as the mare.

CASE REPORTS

CASE 1. W. H., a white male aged twenty-seven, was admitted to St. Vincent's Hospital on May 29, 1933, under the care of Dr. John R. Hand. His chief complaints were pain in the epigastrium of three months' duration, and nausea and vomiting of two weeks' duration.

The patient had been in good health up to six months previous to admission, at which time he lost sensation in his upper lip. Three months prior to admission he de-

Fig. 3. Case 1. Photograph taken at autopsy illustrating the retroperitoneal mass presenting between the pancreas and the lesser curvature of the stomach, and elevating the pylorus and the duodenum toward the anterior abdominal wall.

veloped intermittent, cramp-like pains in the small of his back. The pain persisted, and two weeks later he had an appendectomy. During this time he experienced no nausea or vomiting. From the onset of the pain until after the appendectomy he lost 25 lb. in weight. Following the operation the pains became more severe, and he developed epistaxis and hemoptysis. During this time he continued to lose weight gradually. Two weeks before admission to the hospital be began to have nausea and vomiting. The upper abdomen became distended, but was relieved by the passage of flatus. The last four to five days before admission he was troubled with dizziness. There was a little urgency, but no dysuria or hematuria. Some constipation was present. The stools, however, showed no gross blood.

Physical examination revealed a very emaciated white male, weighing approximately 100 lb. (normal weight was stated to be 150 lb.) The blood pressure was 120 systolic, 70 diastolic. A slightly yellowish tint to the sclerae and blood-tinged sputum in the nasopharynx were noted. There were palpable lymph nodes in the left supraclavicular region. The heart and lungs were normal. The abdomen was very resistant to palpation. Tenderness, however, was elicited in the upper part of the abdomen, especially in the epigastric region. A small nodular mass, about the size of a walnut, was palpated on the left side of the abdomen, just below the costal margin. An appendectomy scar was noted.

Fig. 4. Case 1. Symmetrical distribution of the cellular and the hemorrhagic nodules along the course of the aorta and the iliac vessels.

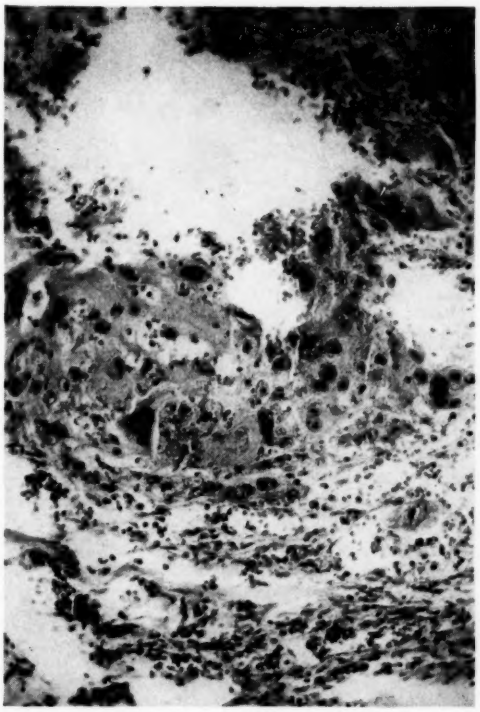

Fig. 5. Case 1. Malignant cells of the syncytial and the Langhans' type lining a vascular sinusoid.

On admission to the hospital the urinalysis showed 1 plus albumin. The blood count, on the following day, was normal except for an icteric index of 12.5. Sedimentation rate was 15 mm. in fifteen minutes and 65 mm. in forty-five minutes. The Kolmer and Kahn reactions of the blood were negative.

X-ray examination on May 31, 1933, revealed the following:

Kidneys. The outline of the kidneys was not visible, being obscured by a dense shadow which appeared to rise medial to the liver. The shadow could not be separated from the liver.

Chest. There was a metastatic carcinoma nodule in the upper lobe of the right lung. Another large nodule occupied the left hilus area and extended into the mediastinum.

Stomach. The stomach was displaced toward the left side by a large tumor mass, and was dilated. There was a duodenal ileus involving the second portion of the duodenum with a delayed emptying time of the stomach and duodenum.

Colon. The colon was markedly dilated and of the relaxed type.

The patient complained of considerable pain in the abdomen, requiring opiates for relief. He was nauseated and vomited on various occasions. He became progressively weaker, and expired the third day after entrance. The

pulse rate, temperature, and respirations were irregular, but did not vary greatly from the normal.

Autopsy showed the following:

Gross examination. The patient was a markedly emaciated white male, twenty-seven years of age. Various sized small nodules were palpated in the superficial and deeper subcutaneous tissue of the left supraclavicular region. The largest of these was about the size of a cherry. The external genitalia were unchanged. Nothing abnormal was palpated in the scrotum. Mild gynecomastia was noted.

A few cubic centimeters of clear, straw-colored fluid were present in the peritoneal cavity. A large, bulging retroperitoneal mass displaced the pancreas anteriorly, and the otherwise unchanged common bile duct coursed over it to the usual opening in the duodenum. This mass elevated the pylorus to the anterior abdominal wall at the edge of the liver. The mass bulged above the lesser curvature of the stomach and displaced the latter inferiorly to the left. The proximal portion of the duodenum was displaced anteriorly by the mass. The pancreas could be entirely separated from the retroperitoneal mass, and over the latter it was a thin, compressed structure. The transverse colon at its midportion reached the symphysis pubis, and the stomach extended below the umbilicus. The prostate gland and seminal vesicles were grossly unaltered. The kidneys were lateral and slightly posterior to the large central extraperitoneal mass and were readily freed from it. The cut surfaces were bloody. The renal vessels were somewhat compressed and displaced superiorly by the tumor mass. Smaller secondary nodules about the renal vessels compressed them moderately. The adrenal glands were unchanged. The retroperitoneal mass was seen to be at the center of the abdomen, located anteriorly, and lateral to the aorta which it compressed and upon which it encroached. It also impinged upon the inferior vena cava, with a bulging area pressing on the left aspect, narrowing the lumen just below the renal veins. In this region the mass measured approximately 13.0 by 8.0 cm. in the transverse and anteroposterior diameters. Sectioning showed what appeared to be one large, central, encapsulated mass and several adjacent large, nodular areas. The cut surfaces presented a mottled red to yellow to pinkish-gray appearance, with friable tissue that was pulp-like in places. Delicate, whitish, fibrous capsules surrounded the spherical nodules of various sizes. This appearance was characteristic of all the abdominal tumor nodules as well as of those found in the mediastinum and the left supraclavicular region. All the mesenteric lymph nodes were enlarged to about three times their normal size and had the appearance of lymphoid tissue.

Multiple large nodules were located in the superior mediastinum. One nodule was found in the upper lobe of the right lung. The thyroid gland was diffusely and symmetrically enlarged. An encapsulated adenomatous nodule was encountered in each lobe, but these nodules showed nothing suggestive of malignancy.

After fixation, each epididymis and the testicles were sectioned at very close intervals. No tumor nodules, scars, or other gross abnormalities were encountered.

Microscopic examination. The abdominal nodules showed large areas of coagulation necrosis. Large blood-filled sinusoidal spaces, like the sinusoids seen in placental tissue, were separated by connective-tissue trabeculæ composed of well differentiated fibrous tissue. In these trabeculæ, however, there were other cells of an epithelial nature, which occurred singly and in clusters in no orderly manner. Among these were large syncytial, multinucleated cells with hyperchromatic nuclei of various sizes. Some had a distinct acidophilic cytoplasm. In addition to these syncytial cells, polyhedral-shaped cells and round cells were present in clusters. These had a paler, pinkish-blue staining fibrillar cytoplasm and very large hyperchromatic nuclei of various sizes and shapes. Many of these nuclei contained well defined nucleoli. The syncytial cells were seen to be forming the immediate lining for many of the larger blood sinusoids, and in places the other cells, as described, were found in these sinusoidal walls, reaching the inner surface.

Sections of all the other tumor nodules, except those about the abdomen and aorta, were composed entirely of the second type of tumor cells which in every respect simulated the malignant Langhans' cell of a chorio-epithelioma. These filled the lymphatic channels and sinusoids, and replaced much of the lymphoid tissue. There were numerous blood-filled spaces lined by these cells. Here there were also a variable number of syncytial cells with hyperchromatic nuclei, but these masses were composed mainly of the Langhans' cells where the latter appeared to be forming chorionic villus-like structures. Only a few of the papillary epithelial extensions contained capillary blood vessels and for the most part the vascularity appeared to be supplied by the tissue, unaided by proliferation of connective tissue and new blood vessels within the tumor nodules.

Lungs. The tumor nodules in the lung were seen only in hilus lymph nodes, where the tumor cells occupied and distended lymph spaces.

Testes. None of the tumor cells described above was found. Spermatogenesis was active and hyperplasia of the interstitial cells of Leydig was noted.

Prostate. Glandular hyperplasia.

Thyroid gland. Colloid goiter.

Other tissues showed no essential changes.

CASE 2. W. M., a white male aged twenty, entered St. Vincent's Hospital on October 23, 1935, under the care of Dr. Walter Kelsey, with the following complaints: (1) weakness and fever of one month's duration, and (2) cough of three weeks' duration.

For three months prior to admission, the patient had noticed a painless swelling in the right side of the abdomen at the level of the umbilicus. Two months prior to admission, he was operated upon for a "twin" tumor of the left testicle. He had been aware of a slow, progressive pain in this testicle. Four weeks following the operation he began to feel weaker, and began to have a dry cough. The cough rapidly became productive, and by the end of another week the sputum was blood-streaked at all times.

The patient had first entered the Multnomah County Hospital where a positive Friedman reaction (4 plus) was obtained. An x-ray plate of the chest showed extensive pulmonary metastases.

A pathological diagnosis of testicular seminoma had previously been made on the testicle removed surgically. Re-examination showed marked necrosis with areas of embryonal adenocarcinoma and round-cell carcinoma appearance. Nothing having the chorio-epitheliomatous appearance of the metastatic lesion, as found at subsequent autopsy, was encountered.

Physical examination revealed a thin, nervous, white male. The skin was warm and moist. The cheeks were flushed, and there was marked wasting. The temperature was 100.8, pulse rate 124, respirations 26, and blood pressure 122 systolic, 84 diastolic. Expansion of the chest was limited but equal. There was flatness and bronchial breathing with increased transmission of vocal fremitus above the third rib posteriorly on both sides. Numerous dry to moist râles were heard throughout the chest. The sputum was frothy and grossly bloody. The breasts were feminine in type. Examination of the abdomen showed the pubic hair to have a feminine distribution. There was a firm, nontender mass in the right side of the abdomen at the level of the umbilicus. This was well demarcated, fixed, but

apparently not attached to any surrounding organs. It was dull to percussion, and did not move with respiration. The left testicle was not present, and the right was atrophic.

Urinalysis revealed 1 plus albumin and a few hyaline casts and pus cells. Blood count showed hemoglobin 7.45 gm. per 100 c.cm.; red blood cells 3,020,000; white blood cells 15,850; polymorphonuclears 90 per cent. The Kolmer and Kahn reactions of the blood were negative.

Treatment was symptomatic, an attempt being made to relieve the restlessness and cough and to combat the anemia. The patient's course was progressively downward. The cyanosis and toxemia became more severe, and he expired thirteen days after admission.

Autopsy revealed the following:

Gross examination. A poorly nourished, white male. The chest bulged somewhat to the right, laterally and inferiorly. No palpable superficial lymph nodes were encountered. A mass was palpated with some difficulty in the right side of the upper abdomen. There was a feminine distribution of the pubic hair. The left side of the scrotum was empty, but thickened by edema in its dependent portion. The liver was a huge structure, measuring 30 cm. transversely, 26 cm. longitudinally, and 13.0 cm. in thickness. The capsule was smooth except for a few slightly red, elevated areas where the parenchyma was replaced by spherical nodules of variable size, the largest 3 cm. in diameter. These had a bloody red to brown-red or gray-red appearance, and centrally were soft and red. Elsewhere the parenchyma was flat and moderately bloody. The huge mass bulged to the right, displacing the inferior vena cava and aorta to the same side. The mass was covered by thin peritoneum, and located to the right of the mesentery of the small intestine. The mass had the following dimensions: length, 14 cm.; width, 12.5 cm.; thickness 14.0 cm. There was one small mural nodule of the intestines, 0.8 cm. in diameter opposite the mesenteric attachment, which, when sectioned, varied from red to brownish-gray. The pelvis of the right kidney was slightly dilated from pressure on the ureter by the retroperitoneal mass. In the midlateral aspect of each kidney there was a solitary nodule 1.5 cm. in diameter. These had the same appearance as the other metastatic nodules. A similar nodule was seen in the right adrenal gland. The right testicle and epididymis were unchanged. The breasts were moderately enlarged and consisted of distinct, rather firm, fibrous mammary-gland tissue. In the deeper portion of the left breast was a hemorrhagic, blood-clot-like, circumscribed area 1.0 cm. in diameter.

The lungs were huge structures. Numerous subpleural nodules elevated the pleura in a spherical, plateau-like and toad-stool-like manner. Over these the pleura was smooth and mottled red to brown. On sectioning, there were huge,

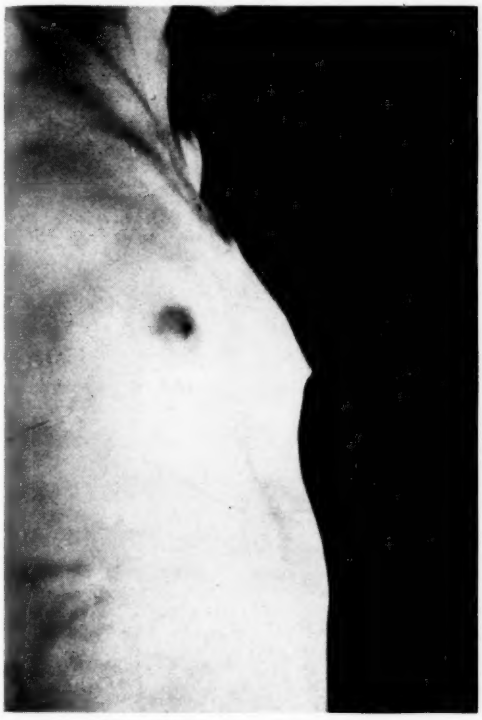

Fig. 6. Case 2. Photograph taken at autopsy to show gynecomastia.

Fig. 7. Case 2. Photograph taken at autopsy showing metastatic nodules of lung, large liver with small hemorrhagic metastatic nodules, and retroperitoneal mass presenting below liver.

Fig. 8. Case 2. One of the metastatic nodules showing the characteristic cytology. Note the syncytial cells and the malignant cells of the Langhans' type.

spherical, firm to soft hemorrhagic appearing nodules, the largest 6.0 cm. in diameter. The rest of the lung tissue appeared bloody and wet. No metastases were seen in the tracheobronchial lymph nodes. The right pleural cavity contained 150 c.cm. of clear, straw-colored, rather thick fluid. The aorta was displaced somewhat to the right by the retroperitoneal mass. The inferior vena cava was surrounded on all sides by the retroperitoneal mass. Part of the wall had been eroded by the tumor, and bare, hemorrhagic, rather smooth tumor tissue lined this part of the inferior vena cava.

Microscopic examination. Tumor: There were masses of syncytial cells. Some of the nuclei of these cells varied in size and shape and were hyperchromatic, others were vesicular and contained nucleoli. Five to six mitotic figures were encountered per high power field. Many large syncytial cells were noted which had an acidophilic cytoplasm. Large areas of hemorrhage were encountered, which contained intact and poorly defined erythrocytes. Both Langhans' and syncytial cells were encountered in the tumor, and exhibited anaplasia. The nodules showed no stroma production and contained no blood vessels.

Liver. The only intact neoplastic cells occurred at the periphery of the nodules. The histological structure of these metastatic nodules was similar to that of the retroperitoneal tumor. Only an occasional group of intact liver cells were encountered here.

Lung. Parts of the lung were replaced by neoplastic tissue and hemorrhage identical in appearance with that described before. The rest of the parenchyma showed edema and hyperemia. Many of the alveoli contained blood-pigment-laden histiocytes as well as erythrocytes, lymphocytes, and an occasional polymorphonuclear neutrophile.

Kidney. Much of the parenchyma in the section was replaced by neoplastic tissue and areas of hemorrhage similar to that encountered in the other organs. There was some parenchymatous degeneration of the lining epithelium of the convoluted tubules.

Adrenal gland. A portion of the right adrenal gland was replaced by characteristic neoplastic tissue.

Small intestine. A small metastatic nodule occupied the wall of the intestine between the muscularis and mucosa.

Right seminal vesicle. No essential changes were present.

Right testicle. No malignancy was present. There was moderate interstitial cell hyperplasia. No spermatozoa were present, and only a few of the younger cells of spermatogenesis were encountered.

Breast. There were scattered groups of ducts and acini which showed budding and slight new acinous formation, about which there was moderate small round-cell infiltration. The hemorrhagic area was a metastatic nodule.

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*Paper read by abstract only.

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Hirsheimer, A.: The Hippuric-Acid Excretion Test in Pregnancy. *Am. J. Obst. & Gynec.*, 1939, 37: 363.

The excretion of hippuric acid after the administration of sodium benzoate by mouth was found to be subnormal in more than half of a group of women with uncomplicated pregnancies. A smaller group of patients who developed toxemia showed a somewhat higher incidence of the same depressed function. After delivery the same test showed increased yields of hippuric acid in almost all of the cases, and a return to normal in those with low ante-partum values.

With few exceptions hippuric acid was excreted rapidly when its sodium salt was given intravenously to normal pregnant women. Forty per cent of a small group of toxemic patients showed diminished excretion in this test. The intravenous hippurate test showed no significant changes post partum as compared to the ante-partum results, except in cases having low ante-partum yields, when the tendency was to return to normal.

The possibility of depressed kidney response to hippuric acid in pregnancy makes it necessary to check renal function in order to interpret the result when a subnormal value for hippuric-acid excretion is obtained after sodium benzoate is given by mouth. Analysis of the urine for hippuric acid after the intravenous administration of sodium hippurate is recommended as such a check. The ingestion of sodium benzoate in pregnancy is followed by changes in the blood and urine uric-acid levels similar to the changes produced in non-pregnant individuals.

EDWARD L. CORNELL, M.D.

Fray, W. W., and Pommerenke, W. T.: Roentgenographic Pelvimetry and Fetalometry: Elimination of Errors Due to Movements Between X-Ray Exposures. *Radiology*, 1939, 32: 261.

The various methods of pelvimetry and fetalometry are reviewed. The author describes his own method which requires a standard to support 2 x-ray tubes above the patient with a constant focal film distance and a constant interfocal distance. The standard is notched for reception of the tubes and thus shift of the tubes is prevented. From the center of the standard, mid-way between the focal spots of the two tubes, a plumb bob is suspended to center the equipment on the Bucky diaphragm and film. A simultaneous exposure of the film by both tubes is made, the intensity of each beam of radiation being independently controlled by separate filament transformers. The film when exposed shows double silhouettes of both the maternal pelvis and the fetal head. The following points are marked on the film: the points farthest from the midline which represent the ends of the maximum transverse diameter; the points of the two oblique diameters extending between the sacro-iliac synchrondrosis and the ileopectineal eminences of the superior pubic rami, and points at the ischial tuberosities representing the ends of the interischial diameter. The authors believe that the true conjugate is best obtained by the lateral method of Thoms.

The accuracy of the new method proposed has been tested and the variation from the true measurement appears not greater than 1 mm. The measurement of the fetal head size may be subject to greater error because of changes in shape or rotation of the head.

The advantages claimed for the method described are the simultaneous use of 2 x-ray tubes which prevents movement of the fetal parts, which frequently occurs when films are obtained in succession; the fixed character of the apparatus which prevents errors due to variation in the focal film distance and shift of the tube; and the decreased cost of examination due to the fact that only a single double exposed film is necessary. HAROLD C. OCHSNER, M.D.

Grier, R. M., and Richter, H. A.: Pregnancy with Leucemia. *Am. J. Obst. & Gynec.*, 1939, 37: 412.

The frequencies of chronic and acute leucemia in the cases discussed by the author were nearly the same.

The course of the chronic cases may be as long as six years, during which time some women have been pregnant more than once. Exacerbation during the pregnancy is the rule.

Only 1 case of chronic lymphatic leucemia has been reported. All the other chronic cases were of the myelogenous type. The majority of the acute cases were myelogenous, and the ratio of this type to those of the lymphatic type was 11 to 8. Premature labor is frequent in the acute cases, less frequent in the chronic cases. The prognosis for the babies is good in the chronic cases after viability, but less favorable in the acute cases because of the frequency of premature delivery. None of the babies showed evidence of leucemia. Hemorrhage during delivery of the baby and the placenta was conspicuously uncommon. No women died of uterine hemorrhage among the chronic cases and only 1 woman died among the acute cases.

No treatment of leucemia has been satisfactory. In the chronic forms roentgen irradiation apparently aids in the production of a temporary remission of the leucocytosis and the symptoms. Blood transfusion has a very transient effect on secondary anemia but is the only treatment of value in the acute leucemias. Pregnancy should be avoided when leucemia is known to be present. Only in the chronic forms may it be permitted if the woman insists and if her condition is explained to her. Interference with pregnancy does not help the mother in either

form. It only tends to produce premature or nonviable babies. In the acute forms it shortens the mother's life. EDWARD L. CORNELL, M.D.

LABOR AND ITS COMPLICATIONS

Dellepiane, G.: The Basic Physiopathology and Pharmacology in the Medical Treatment of Labor (I fondamenti fisiopatologici e farmacologici del trattamento medico del parto). *Ginecologia*, Torino, 1939, 5: 7.

The object of rational medical treatment of labor is to ensure the greatest security with the least suffering and danger. Pregnancy and labor are analogous to the third and fourth stages in the menstrual cycle; the period of pregnancy corresponds to the phase of maturation of the corpus luteum in the menstrual cycle; and the period of parturition and puerperium corresponds to the menstrual and postmenstrual phases. Thus, there are neuro-endocrine fluctuations in pregnancy and labor just as in the menstrual cycle. In one phase, under the action of corpus luteum, placental hormones, anterior hypophysis, adrenal cortex, and the predominant vagal tone of the individual, there is a relaxation of all the hollow organs with smooth muscle fibers, particularly the uterus. In the next phase, corresponding with the end of pregnancy and the beginning of labor, there is a systolic or contractive reaction under the influence of the posterior hypophysis, the adrenal medulla, some placental hormones, and folliculin of the ovary. However, the problem of labor in all its aspects represents always an individual clinical problem. With due credit to all modern advances and theories we must still individualize the biochemical, neuro-endocrine, and clinical characteristics of the parturient patient.

Modern researches are cited which tend to clarify our understanding of the mechanism involved in the beginning of labor. These studies have also shown how variously the uterine muscular fibers respond to particular hormones. Modern investigations on the general and tissue reactions of the individual are cited; thus the diminution in weight of the individual before the onset of labor, the increase in the adrenalin content of the uterus and in the chromaffin cells of the uterine nerve ganglia, hyperglycemia, modifications in the plasma albuminoids, alteration in the basal metabolism, excess of potassium over calcium, and increased carbon dioxide in the blood, all indicate profound constitutional changes during pregnancy. Also there are variations in the physiology of pregnancy which must be taken into consideration. The duration may vary from two hundred and fifty-eight to two hundred and ninety-seven days; in hypogenitalism pregnancy is less prolonged than in hypergenitalism, while in dysgenitalism there is a tendency toward abortion. All of these facts indicate the diverse modes of origin and evolution of labor in the individual, especially if we include the mechanical conditions and the diseases of mother and fetus. Likewise with equal age, multiparity, and similar skeletal structure, the individual prognosis and dynamic evolution of labor may vary with the situation and presentation of the fetus, and the degree of accommodation of the lower uterine segment.

Furthermore, a rational medical treatment of labor presupposes a thorough knowledge of the mechanism of labor in order to understand all the processes which eliminate obstacles to the progress of the fetus, and at the same time favor the motor activity of the uterus. The basis of the medical treatment is the modern knowledge that the uterus is an organ richly innervated by the vegetative nervous system, which varies quantitatively and qualitatively in the corpus and in the cervical segment with a resulting correlation of function in the two segments, which permits the corpus uteri to assume a motor function while the inferior segment acts as a canal of passage. Such a relative autonomy of the various uterine segments, proved by precise clinical and experimental studies, indicates the dependence of the corpus uteri on the sympathetic, and the inferior segment on the parasympathetic nervous systems. The author believes that the sympathetic system acts as an excitomotor to the corpus uteri, and that the parasympathetic system acts in the same way for the inferior uterine segment and the cervix, but it inhibits the corpus uteri. The beginning and evolution of the function of labor is influenced by the neuro-endocrine constitution of the individual. The physiological progress of labor is further modified by the varied response of the individual and his race; thus in the black race labor lasts longer than in the white race although the fetus is smaller and there are less mechanical difficulties.

If we may agree with Frey, Kreis, Scarpitti and others that the progress of labor depends on the number of contractions, the resistance encountered, and alterations of the muscle tone by rest and contractions, rational medical treatment cannot be carried out without an evaluation of the number, duration, and intensity of the contractions, as well as a knowledge of the basal tone of the uterine muscular fibers. Such observations are facilitated by the entrance into clinical use of accurate instruments such as the hysterotonograph or the electrohysterograph. Due to modern abnormal stimuli the uterine basal tone may degenerate and the two uterine segments may assume a perverted function (the syndrome of Schikele). It will be a grand victory for obstetrical medicine if some day we may be able to overcome such dystocias by medical treatment without resort to operative intervention. Such treatment will be able to sustain and imitate natural phenomena without harm to mother or child.

Now what medical means are at our disposal which coincide with our physiopathological premises and needs? The medical treatment may reinforce and modify the contractions of the corpus uteri and diminish the resistance of the lower part of the birth canal; in short, it may particularly affect the uterine dynamics. Medical treatment cannot offer any control of the resistance of the pelvic ring. The hunger

cure formerly advised to lessen the size of the fetus is not practiced any more; nor is the intensive mineralization of the patient during pregnancy practiced any more since it interferes with the mechanics of labor by premature ossification in the fetus.

Formerly it was held desirable to maintain the integrity of the bag of waters for complete dilatation of the cervix; but now, since the work of Kreis, this is considered inconsequential. Actually it has been advised by Schikele and Kreis to hasten the dilatation by artificial rupture of the bag of waters at the onset of labor aided by the administration of antispasmodic drugs. On the contrary, some hold this procedure as harmful since it may induce a state of spasticity. However, the author would credit Kreis with calling attention to the possibilities of controlling uterine dynamics with drugs. As for artificial rupture of the membranes, the author would consider this only in certain cases in which the uterine dynamic conditions and the presenting part are completely understood and when the cervix is considerably dilated.

For relaxing the cervix and causing a relative analgesia, a hypochloride diet has been suggested by Karpati and experimented with by Lorenzetti of Turin. The theory is that the plasma and tissue deficiency in chlorides leads to a dehydration of the tissues and induces a relative analgesia and increased relaxation of the cervix. Researches carried out in the author's clinic indicate that this result is due to the relative excess of bromides induced by this diet.

The uses of quinine and posterior-pituitary-lobe extract as oxytocic drugs have been thoroughly worked out. Opiates, particularly papaverine, act as analgesics and have a depressing effect on the uterine muscle. Likewise, belladonna and its derivatives, atropine and scopolamine, especially the latter in association with morphine, have been used to control pain with a minimal influence on the dynamics.

Nowadays the progress in the pharmacological, physiopathological, and clinical aspects of labor have thrown new light on these drugs and the possibilities of their suitable application. Important progress has been made in our knowledge of the active principles of secale cornutum; ergotoxine and ergotamine are the most active. Their action is mostly on the smooth muscle. In small doses they excite and in large doses they paralyze the sympathetic terminals which do not react any more to adrenalin. Among the other principles which act on the uterus may be mentioned choline, acetylcholine, tyramine, and histamine. However, only histamine is present in sufficient amounts (of the last mentioned drugs found in secale cornutum) to produce any noteworthy action. Ergotamine and ergotoxine are used chiefly in the prophylaxis and treatment of post-partum atony. Finally, Moir, Dale, and others, in 1932, found that an aqueous extract of secale cornutum contained an active principle which stimulated the uterine fibers and which has been called ergonovine. It has an action more rapid and intense than ergotamine or ergotoxine. It also lacks the anti-adrenalin action of the other alkaloids. Much similar to ergonovine is ergobasine isolated more recently by Stoll and Burckhardt. All these drugs are indicated in the third stage of labor; they are contraindicated in the stage of dilatation and expulsion.

As concerns the hypophysis, it exhibits oxytocic, hypertensive, and anti-diuretic actions. Recent researches indicate the isolation of an active principle from the posterior hypophysis which is identical in its action with ergonovine. The action of the oxytocic hormone of the posterior hypophysis varies with the neuro-endocrine condition of the individual and with the state of pregnancy or labor. The combined use of this extract with placental extracts and folliculin in labor has passed the experimental stage and is being tried in the clinic.

As concerns the oxytocic action of quinine, recent studies show that it acts only when the uterus tends to contract spontaneously, namely, in the last phase of pregnancy and at the beginning of labor. This finding will tend to clear the prescribing pharmacist of accusations of inducing abortion. Recently it has been found that calcium augments the excitability of the uterine muscle fibers. This may be of clinical importance in the initiation of labor with quinine or extracts of the posterior lobe of the hypophysis.

Vitamin C has an important action on the uterus. It is found in considerable amounts in the placenta. It acts as an anti-spastic, anti-hemorrhagic, anti-asphyctic substance on the fetus, and an anti-asthenic substance on the mother. This beneficent action of ascorbic acid is due to its reducing powers which aid the metabolism of the uterine musculature.

The belladonna derivatives because of their depressing action on the parasympathetic system and their exciting effect on the sympathetic system would seem to find their greatest usefulness in the period of dilatation, especially in the presence of a spastic or hypertonic resistance in the lower uterine segment. Atropine derivatives act purely on the muscle fibers and cause a relaxation.

As concerns the opiates, their use is based on the general analgesic action of morphine and the peripheral depressing action of papaverine. A uterine muscle fiber which is relaxed by opiates is still susceptible to excitation by extract from the posterior hypophyseal lobe, but not by secale cornutum. This is a proof of the diverse mode of action of the posterior lobe of the hypophysis and secale cornutum on the uterine muscle fibers. The use of scopolamine with all the alkaloids of opium results in a eutonic and hyperkinetic action on the uterus.

On the solid basis of physiopathology and pharmacology the medical treatment of labor is now a useful aid to the obstetrician and offers more possibilities for the future care of the mother and the child in the difficulties of labor. There are offered possibilities of systematic medical conduct of labor with a minimum of operative interference, based on a high plane of active assistance instead of a passive conduct of labor. These medical methods of pro-

phylaxis and treatment are best used in dynamic dystocia only after intelligent and rational observation. JACOB E. KLEIN, M.D.

PUERPERIUM AND ITS COMPLICATIONS

Preissecker, E.: Disturbance of Function in the Female Breast During the Suckling Period and Its Treatment (Die Funktionsstoerungen der weiblichen Brust in der Stillperiode und ihre Behandlung). *Ergebn. d. inn. Med. u. Kinderh.*, 1938, 54: 702.

The subject of this report is especially interesting and important as in the last few years the hormonal relationships between genital function and lactation have been established. The contribution of this author is especially clear concerning what is of importance, in consideration of the vast literature on this type of experimental hormonal investigation. He notes that the final relationships, especially with the adrenal cortex, are still lacking. It can be stated with certainty that the follicular hormone and the hormone of the corpus luteum are the preparatory factors for lactation which, in turn, is initiated by the lactogenic hormone of the anterior lobe of the hypophysis. In order to make this relationship clear to the reader, he has included in his paper the schematic, pictorial representation of Liebke published in the *Zentralbl. f. Gynaek.*

After the physiology of lactation, the disturbances of function in the female breast, especially hypogalactea, are discussed. Here also the author should be commended on his clarity and brevity and not giving details about things which are now generally known. The treatment of hypogalactea with vitamins, for which the entire vitamin alphabet appears to be adapted, is something new. The artificial arrest of lactation or weaning is discussed from the hormonal point of view.

The bibliography is well assembled except for a few omissions, and can be recommended to anyone who wishes to become familiar with this field.

In conclusion the author states that, in spite of our advance in knowledge concerning vitamins and hormones and in spite of the indisputable triumphs made in the laboratory, we must still recognize that the best method for stimulation of a poorly functioning mammary gland is thorough mechanical emptying by the sucking child, the pump, or manual milking.

Therefore, in the final analysis, our knowledge concerning the hormone and vitamin cycles represents interesting laboratory results, but unfortunately is without practical application.

(F. SIEGERT). RONALD R. GREENE, M.D.

MISCELLANEOUS

Gray, J., Kenny, M., and Sharpey-Schafer, E. P.: Metastasis of a Maternal Tumor to Products of Gestation. *J. Obst. & Gynaec. Brit. Emp.*, 1939, 46: 8.

A case of anaplastic tumor of the suprarenal gland with extensive metastases, including growth in the uterus and placenta, is recorded. Secondary malignant growth in the child did not occur during the six months of life. Thus, in spite of the placental involvement, survival with multiplication of the tumor cells was confined to the tissues of the individual in whom the tumor had arisen. In 3 of 6 cases in the literature, the maternal tumor metastasized to the fetus. In only 1 was the tumor proved to be present in the mother, the placenta, and the child. CHARLES BARON, M.D

GENITO-URINARY SURGERY

ADRENAL, KIDNEY, AND URETER

Frattini, P. G.: Descending Pyelography in Contusions of the Kidney (La pielografia discendente nelle contusioni del rene). *Arch. ital. di chir.*, 1938, 49: 557.

In his experiments on rabbits, Frattini used intravenous pyelography by injecting 3 c.cm. of perabrodil solution per kgm. of body weight, after having caused varying degrees of contusion by direct digital compression of the right kidney. The object of the experiments was to study the roentgen pictures that could be obtained by the intravenous method of pyelography; the diagnostic possibilities of the method, especially when employed immediately after the traumatism, the eventual consequences of the injection of contrast substance on the general condition of the subject and on the healing process of the involved kidney; and, finally, the evolution of the healing process. Lately, he has applied the method of descending pyelography in 2 cases of accidental traumatism to the kidney, 1 of which he reports in detail.

The author feels justified in concluding that:

Only a temporary inhibition of the renal function follows even a serious traumatic lesion of the kidney, except in cases in which the renal artery has been ruptured. The method of descending pyelography is advisable for the study of renal traumatism; its harmlessness allows its immediate or nearly immediate use after the traumatism has occurred. The descending pyelogram shows the anatomical and functional condition of the kidney and thereby indicates the treatment to be applied; if the pyelogram does not reveal any increase in the opacity of the renal shadow or any visualization of the upper urinary tract, there is good reason for suspecting a lesion of the vascular pedicle. However, in cases in which, notwithstanding the gravity of the clinical picture, increased opacity of the renal shadow and visualization of the upper urinary tract are present, the kidney has retained its function and watchful waiting is indicated, provided that the condition of the patient or some complication does not impose urgent surgical intervention. During the process of healing, the method allows following-up of the functional condition of the renal parenchyma and of the urinary tract; besides, it gives valuable information on the condition and function of the contralateral kidney. Intravenous urography is a simple, secure, and innocuous diagnostic means of determining the damage done and the location of the lesion; it may be combined with the ascending method if the renal shadow remains absent.

RICHARD KEMEL, M.D.

Lee, H. P.: Nephrobronchial Fistula, with Reports of 2 Cases. *J. Urol.*, 1939, 41: 117.

Bronchial fistula should be suspected in those cases in which the patient gives a history suggesting a pathological process in the kidney or perinephric abscess, accompanied or followed by pulmonary symptoms, severe cough, and profuse sputum. Some degree of pulmonary involvement probably accompanies many perinephric abscesses, but the sudden onset of severe cough and profuse purulent sputum is a particularly significant symptom of bronchial involvement. Physical findings suggesting perinephric abscess, râles or dullness in the overlying lung base, and elevation of the diaphragm with an overlying inflammatory process in the lung (as shown by x-ray films) may give additional evidence. Cystoscopy and pyelography may reveal nothing, or one may find pyonephrosis with escape of the pyelographic medium into the perirenal area; occasionally the patient may taste or even expectorate the pyelographic medium. Rarely can the nephrobronchial tract be visualized with x-rays.

Drainage of the perinephric abscess usually results in immediate and marked relief of the cough and sputum, with a more gradual but usually complete clearing up of the pulmonary involvement. When the kidney is markedly involved, nephrectomy may be necessary later.

Two cases of nephrobronchial fistula are reported.

ELMER HESS, M.D.

Caporale, L.: Two New Personal Methods of Fixation of the Kidney: Nephropexy with Catgut Sling and Nephropexy with Perirenal Subcapsular Loops of Catgut Sutures (Su due nuovi metodi personali di fissazione del rene: a, La nefropessi con nastro di catgut; b, La nefropessi con anse sottocapsulari perirenali di filo di catgut). *Arch. ital. di urol.*, 1938, 15: 598.

Perirenal fixation in case of prolapse of the kidney is superior to other methods because it produces insignificant anatomicopathological changes. In his experiments on dogs, Caporale found that the use of a catgut sling left the renal function unaltered, and that the catgut was resorbed in from thirty to forty-five days and was replaced by connective-tissue adhesions, 7 to 8 cm. wide, which became stronger with the lapse of time. This encouraged him to use the method in man, for whom he devised two methods.

In the first, for which he employs catgut ribbon, he exteriorizes the kidney and makes in its capsule two horizontal, parallel incisions, just wide enough to allow passage of the catgut ribbon and as far apart as the width of the ribbon. Three passages are provided on the anterior and three on the posterior aspect of the kidney, and one passage on each of its poles; the ribbon is tied at the upper pole. Incisions are then made for a second ribbon to be installed on the outer half only of the transverse axis of the kidney; this ribbon is passed under the first, reversed, and tied on the convex surface of the kidney. The two upper heads of the ribbon are fixed in the tenth

intercostal space and the two outer heads to the lumbar mass.

In his second method, he uses catgut ligatures mounted on an ordinary straight needle. Starting at the upper part of the anterior aspect of the kidney, he passes the needle under the capsule for about 2 cm., keeping one fingerbreadth from the convex border of the organ. Three passages bring the needle out at 1.5 cm. from the lower pole, where the ligature turns around the convex border to the posterior aspect with one or two passages, and it is returned by way of the concave border to the anterior aspect, where three passages bring it out at the level from which it started. Another ligature is introduced in the same manner on the posterior aspect of the kidney and the corresponding ends of both ligatures are tied together. Ligatures forming a simple loop in the vicinity of the concave border are installed on both aspects in the transverse axis of the organ, and the corresponding ends of these ligatures also are tied. Fixation of the heads of the ligatures is the same as in the first method. An advantage of this method is that by pulling on the various ligatures it is possible to make the kidney assume its original position as nearly as is feasible. Experiments on dogs have shown that strong connective-tissue adhesions are also obtained with these ligatures. Excellent late functional results have been demonstrated with both methods in several patients. RICHARD KEMEL, M.D.

Graves, R. C., and Buddington, W. T.: Nephrostomy: Indications and Technique. *J. Urol.*, 1939, 41: 265.

Nephrostomy is a conservative operation and affords a direct channel for drainage of urine or infectious material to the surface of the loin when the normal excretory passages are closed or inadequate. It provides a safe substitute for nephrectomy in certain cases of bilateral disease. It may serve as a temporary expedient or as a permanent solution of the problem. The most common reason for nephrostomy is to provide safe and certain drainage for the kidney, following the removal of stones through its cortex. Such drainage is usually temporary and may be dispensed with when bleeding and infection have been controlled. It affords an invaluable opportunity for direct lavage of the renal pelvis for the removal of clots and stone fragments, and for bringing about the necessary bacteriological and chemical changes to make the kidney a less favorable place for the further formation of calculi. All irrigations should be performed with utmost gentleness, with avoidance of overdistention of the pelvis. There should be less rather than more hurry for removal of the tube, and before its removal the ureter should be open and ready for normal drainage. This is determined by noting whether mercurochrome or indigocarmine enters the bladder after their instillation into the renal pelvis or by roentgenography with opaque media. Chills and fever following the withdrawal of the tube may be the signal for its replacement. The next most common indication for nephrostomy is temporary drainage of the kidney during healing of the lines of suture in plastic operations upon the renal pelvis or upper ureter. The tube should be carefully placed; it should traverse the lower calyces so that dependent drainage is assured and in such position that its tip will inflict the least possible injury to the pelvic wall, especially at the ureteropelvic junction, so as to avoid a stricture.

The following indications for nephrostomy as encountered in the authors' cases are discussed: (1) renal drainage following the removal of stones through the cortex; (2) renal drainage during healing of the lines of suture following plastic operation upon the renal pelvis or upper ureter; (3) ureteral occlusion by malignant disease; (4) acute ureteral occlusion by edema following electrocoagulation or irradiation of tumor of the urinary bladder; (5) bilateral nephrolithiasis with marked impairment of the total renal function; (6) the first step in a two-stage nephrectomy; (7) bilateral hydronephrosis, usually congenital in origin, and often associated with atony of the ureter above and below the point of stenosis, with marked impairment of the total renal values; (8) obstruction of the ureter by impassable inflammatory stricture; (9) an associated procedure with uretero-intestinal anastomosis; and (10) a life-saving measure in profound toxemia from severe pyelitis of pregnancy when milder measures have failed.

The operation is done under regional or local anesthesia. Except occasionally, when the kidney is greatly overdistended and thin-walled, nephrostomy for drainage should not be attempted through a stab wound through the cortex, as with this method it is impossible to determine whether the tube is well placed within the excretory passages. The parenchyma may be thick and the pelvis relatively small. The cortex is soft and friable and readily penetrated with a blunt instrument. The wall of the renal pelvis, however, may be quite resistant so that the tube or instrument introduced from without may be deflected along the side of the pelvis and be useless for drainage, although palpation in the region of the renal hilus may lead to the belief that the cavity of the pelvis has been entered. The authors employ a malleable stylet for this purpose, which is introduced through an opening in the upper ureter or, preferably, the extrarenal portion of the pelvis, and is then led out through the cortex via the inferior calyces if possible, to emerge from the convex border of the lower pole of the kidney. The nephrostomy tube may be attached to this and drawn downward into the pelvis. Following the suggestion of Cabot, a silk thread is attached to the tip of the stylet, drawn downward through the kidney and out of the opening in the pelvis or ureter. The distal end of the tube is attached to the thread, and the outer end of the thread is pulled as a guide; the authors then draw the tube out through the cortex until its proximal end lies in the desired position within the pelvis. Irrigation with normal saline solution is then used to wash out clots, sand, or infectious material. Usually

the ureterotomy or pyelotomy incision is not closed, as these openings heal with a properly functioning nephrostomy and provide additional drainage. Rubber tissue wicks are led to this region in front and in back of the kidney before the wound is closed. The cortical wound is closed snugly around the tube with mattress sutures of plain catgut, which include bits of fat or muscle to prevent cutting through. The tube is made to emerge in the flank. Care must be taken, however, that the path to the kidney is not made too tortuous and the changing of the tube be complicated unnecessarily. Undue angulation of the tube may be avoided by a stab wound just above the last rib. In long-term or permanent nephrostomies it is well to suture the renal capsule to the lumbar fascia along the upper edge of the wound to prevent changes in renal position and direction of the sinus.

An ordinary soft, black rubber drainage tube with additional openings for the portion lying within the renal pelvis is used. It is kept in position by a fine, non-absorbable suture to the skin, and if necessary by a suture of plain catgut to the renal capsule. In permanent or long-term nephrostomies, the tube is removed after two or three weeks and replaced by a soft-rubber whistle-tip catheter, which is kept in place with a rubber opercular disc.

Until convalescence is well established, the maintenance of diuresis by parenteral fluid therapy and support of the circulation is very important. The urine should be kept acid to prevent alkaline incrustation in and around the tube. The position of the tube should be checked occasionally by means of retrograde pyelography. LOUIS NEUWELT, M.D.

Fagerstrom, D. P.: Ureterectomy: Its Indications as an Adjunct to Nephrectomy. *J. Urol.*, 1939, 41: 137.

In performing nephrectomy it is customary to remove a small portion of the ureter, and this holds true in a large majority of cases. There are occasions when, as a result of gross disease and structural changes, the ureteral stump becomes a source of chronic ill health which can be relieved only by secondary ureterectomy. Secondary operations are often extremely difficult and are attended by considerable risk. It is therefore manifest that primary nephro-ureterectomy is the procedure of choice when there are indications that the ureter left *in situ* may prove a menace.

Ureterectasia frequently accompanies hydronephrosis. In both hydronephrosis and pyo-ureteronephrosis, primary total ureterectomy is indicated. Partial ureterectomy frequently leaves behind a pouch that may produce all the symptoms of an infected and poorly draining vesical diverticulum.

Ureteral calculi in the ureteral stump often require secondary operations. It therefore becomes of paramount importance to determine the patency of the ureter prior to nephrectomy and, should the factor of drainage be in doubt, the more radical procedure of nephro-ureterectomy will often prove to be the more conservative surgery.

In cases of nephrectomy for tuberculosis, fistulas may persist for months because of a diseased ureteral stump, while secondary infection from ill-advised drainage, and tuberculous infiltration of the renal pedicle and, particularly, of the surrounding fat may all serve as chronic foci of wound infection.

Such instances are not uncommon, and they confirm the opinion that diseased structures other than the ureter are often responsible for postoperative complications. The author therefore believes that when a tuberculous ureter harbors such structural changes, nephro-ureterectomy will often spare the patient the distressing complications that retard recovery.

In tumors of the renal pelvis and ureter, practically all surgeons today agree that the indications for total ureterectomy approach the absolute. The tendency of papillary growths to spread by surface extension and mucosal implantation makes mandatory the ablation of the kidney and the entire ureter, including resection or thermal destruction of the ureteral meatus. When a ureter which has been left behind (due to no apparent or palpable involvement) is removed a few months later because of recurrent hematuria, a large number of these vegetations may be revealed.

There are a few other indications, including primary ureteral neoplasms, which occur in the lower segment of the ureter, for total ureterectomy. The ectopic ureter is usually markedly dilated and found in association with a kidney that is either malformed or rendered almost functionless by infection.

The author concludes that nephro-ureterectomy is indicated without question in cases of papillary tumors of the renal pelvis. In other types of pathology the indication hinges mainly on the size and hydrodynamics of the ureter. When grossly infected kidneys are removed, it is unwise to leave a large, non-draining ureteral pouch. ELMER HESS, M.D.

Foord, A. G., and Ferrier, P. A.: Primary Carcinoma of the Ureter. *J. Am. M. Ass.*, 1939, 112: 596.

The authors report 6 proved cases of carcinoma of the ureter and a probable seventh. From a careful study of the literature, they concluded that 1 per cent of the carcinomas of the upper urinary tract originate in the ureter.

Age does not seem to play an important part in this pathological condition, the youngest patient having been twenty-two and the oldest eighty-nine years of age. Hematuria was a prominent symptom in 72 per cent of the cases, and pain occurred in 60 per cent. The tumor may be palpable.

Cystoscopic and x-ray studies with urographic exposures are of diagnostic value. In about 30 per cent of all the cases reported, protrusion of the growth at the bladder end of the ureter was visible, which aided materially in the establishment of the diagnosis. The treatment in these cases was early surgical nephro-ureterectomy. In all instances the prognosis is very unfavorable.

The authors state that 5 additional cases have been described by Charles C. Higgins.

J. SYDNEY RITTER, M.D.

BLADDER, URETHRA, AND PENIS

Godard, H.: Exstrophy of the Bladder and Epispadias in the Male (L'exstrophie vésicale et l'épispadias masculins). *J. d'urol. méd. et chir.*, 1939, 47: 97.

Godard describes a method of operation for exstrophy of the bladder in which the bladder is invaginated, and its abnormal orifice closed; it is freed from its peritoneal attachments, brought down in the pelvis, and fixed to the perineum prerectally, with perineal derivation of the urine. The bladder may then be controlled by the anal sphincter, or later a plastic operation on the urethra may reconstitute the normal urinary passage. This operation is not to be attempted until the child is five or six years of age. It is not to be expected that these patients will urinate entirely normally, but a fair degree of continence can be obtained.

The author reports 3 cases operated upon by this method; in the first case, after a plastic operation on the urethra, urination was fairly normal; the boy lived three years in good health and then developed an acute pyelonephritis that caused his death. In the second case, the operation was done on an infant of five months (at too early an age), and death resulted from postoperative shock. In the third case, following a plastic operation on the urethra, the esthetic result was good, but urinary continence not "perfect," although the condition was much improved.

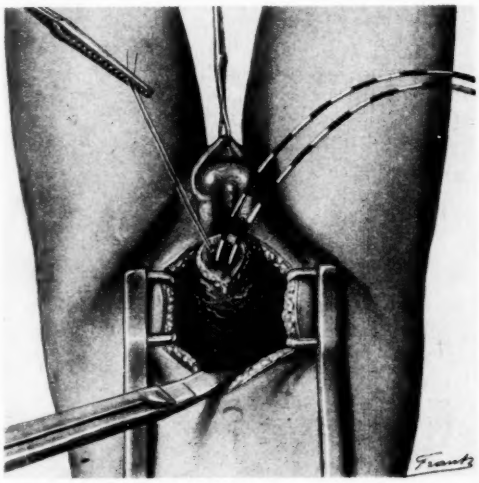

Fig. 1. Liberation of the sac of the bladder. Note the plane of cleavage in the posterior-superior zone of the peritoneum.

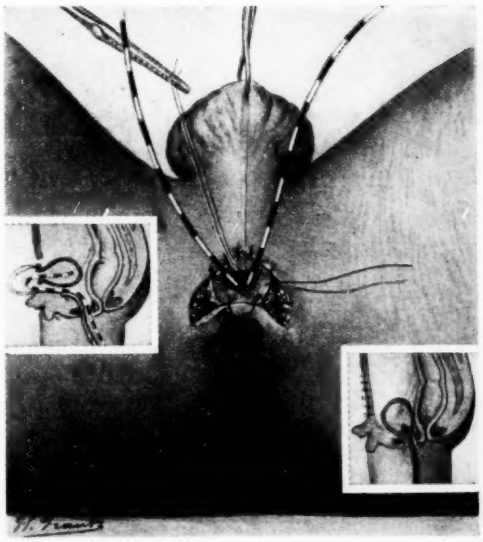

Fig. 2. Descent of the bladder in the pelvis and prerectal perineal fixation of the neck of the invaginated bladder. At the left, after the creation of the prerectal opening, the forceps picks up the traction suture. Below and to the right the descent is terminated.

Lepoutre has reported a fourth case operated upon by this method; the patient was a boy two years of age, too young to permit determination of the degree of urinary continence which will be obtained.

ALICE M. MEYERS.

Dillon, J. R.: The Value of Gradual Decompression and Preliminary Drainage in Bladder-Neck Surgery. *J. Urol.*, 1939, 41: 164.

The author takes a firm stand against proponents of rapid, complete emptying of the chronically distended bladder. The fact that from 85 to 90 per cent of patients can withstand sudden decompression is no reason for endangering the lives of the remaining 10 or 15 per cent, with the possible loss of 4 or 5 per cent who cannot endure it. Illustrative cases are presented to show disasters eventuating from too rapid evacuation of the bladders in vesical-neck obstruction and the more fortunate results in cases treated by gradual decompression.

If, according to the long-accepted idea, catheterization causes a sudden fall in the intrapelvic pressure of the kidney and produces edema and hemorrhages into the parenchyma and pelvis, thus explaining hematuria and renal failure, it may also produce an ideal field for infection. Such infection may be present from the start, especially in cases with ureteral reflux. With the renal congestion resulting from sudden decompression, suppurative foci in the renal parenchyma are further aggravated.

The amount of residual urine or the extent of bladder distention is not the only criterion upon which to base the rate of decompression. Blood chemistry is a valuable guide; but most important to the author is the first sign of loss of appetite, or malaise. Such an observation should be a warning to slow up the decompression, force fluids, and keep the patient in as much of a Fowler's position as he will tolerate. This can be facilitated by putting high shock blocks under the head of the bed to combat reflux and favor gravity drainage of the kidneys.

ARTHUR H. MILBERT, M.D.

GENITAL ORGANS

Ascoli, R.: An Infrequent Inflammatory Form of Disease Attacking the Male Genitalia, the So-Called Spontaneous Gangrene of the Genitalia (Di una non frequente forma infiammatoria a carico dei genitali maschili, la cosidetta gangrena spontanea dei genitali). *Arch. ital. di urol.*, 1938, 15: 565.

Ascoli reports the case of a man, aged sixty-seven years, who had a disturbance of micturition with some pollakiuria for one year and turbid urine for some undetermined time, and developed a diffuse swelling of the penis with fever, general malaise, and aggravation of the urinary disorder three days before admission. The swelling was limited to the superficial tissues of the penis only, and the urethra was not involved. On the day after admission, the swelling had increased, notwithstanding treatment, and a number of ecchymotic patches were noted which later turned black and necrotic. After suprapubic cystotomy to put the urethra at rest and prevent any irritation, incision of the lower aspect of the penis gave issue to a yellowish fluid which infiltrated the tissues. Regression of the edema began three days later and elimination of the necrotic parts was complete on the thirteenth day after admission.

Spontaneous gangrene of the genitalia may be confused with a whole series of infections of the genitalia of urethral origin. In the present case, the distinct impression was gained for some time that there was question of a urinary infection of urethral origin. However, some signs of common periurethritis were absent: the swelling was evenly distributed over the whole surface of the penis; there was no increased swelling and pain of the urethra and of its cavernous body compared to the remaining part of the penis, nor any signs of urethral stenosis; and the swelling was strictly limited to the pendulous portion of the penis and showed no tendency toward extension to the abdominal wall or the scrotum.

As to the pathogenesis of the case, the patient had prostatic difficulty, and at least during the initial period of the disturbance, presented septic urine and urinary disturbances. It is most probable that the infection occurred through the urine and that the portal of entry of the infection was an erosion of the prepuce macerated by the frequent passage of urine.

Various treatments have been proposed for the disorder as there is no immediate urgency for surgical intervention, because of the lack of a tendency toward spreading on the part of the disease. The treatments include local applications of antiseptic solutions, partly intravenous and partly intramuscular administration of anti-gangrenous serum (from 150 to 200 c.cm.), and the injection of strong doses of arsphenamine. However, surgical intervention seems to be more logical for the ample drainage of the infiltrated tissues and application of antiseptic solutions. Relatively superficial incisions suffice; they do not offer any particular gravity and can be made without recourse to general anesthesia. It also seems advisable to associate with the surgical intervention all the measures likely to favor the process of healing, such as serum therapy.

RICHARD KEMEL, M.D.

Hinman, F.: The Treatment of Prostatism. *J. Am. M. Ass.*, 1939, 112: 424.

In a well written, concise article, the author reviews the present-day prostatic problem. Prostatic bars or contractures, hyperplasia, and malignancies are viewed as distinct pathological entities, with the recognition that they may overlap and be complicated frequently by infection and calculi.

On a pathological basis, the theoretical and practical points in the surgical approach are thoroughly emphasized. As a result of previous training and biased opinions, many urological surgeons are unable to fit the theoretical surgical procedure to a patient. The author observes that in many institutions of training in urology only the suprapubic or perineal operations are emphasized, while in other institutions only the transurethral operations are emphasized.

The merits of the suprapubic, perineal, and transurethral operations are painstakingly evaluated. The suprapubic operation carries a mortality of from 8 to 20 per cent (average 8 per cent); hospitalization is from thirty to forty days; the technical difficulties are not great; and the functional results are good if the patient survives. The perineal operation for the unskilled is technically difficult and "the fear of impotence, of incontinence, and of fecal fistula is overcome only with complete mastery of the details of technique." The functional results are good. The greatest advantage of the perineal operation is in the treatment of carcinoma, "because it is the only method which cures cancer." If carcinoma is suspected emphasis is placed on early diagnosis by perineal exposure, or aspiration biopsy and microscopic sections. The improved modern perineal operation entails an average mortality of 3 per cent, and hospitalization of from fifteen to forty days.

Admitting that transurethral prostatic surgery is popular, and that in expert hands the mortality may be as low as 1 per cent, the over-enthusiasm has spent itself. The author believes that a high rate of recurrences on the basis of incomplete operation is inevitable and that the poor results with complicat-

ing infections will outweigh the questionable factors of safety, short hospitalization, and its futility in the cure of cancer. In large series of prostatic resections, many earlier cases are being included in which the risk of prostatectomy would not have been advised. These earlier cases are better surgical risks; hence the mortality should be reduced. Because such large series of resections have been reported during the past decade, the question is again raised as to whether or not many patients are being subjected to this procedure when surgery is not indicated, or when palliative measures may preclude the necessity of surgical intervention.

The author again presents to the profession his vast experiences and excellent results following perineal prostatectomy. By careful study, organization, and masterly improved technique, the perineal approach is the procedure which he has found to be the most reasonable and logical.

LEANDER W. RIBA, M.D.

Davis, E.: Prostatectomy or Resection? *J. Am. M. Ass.*, 1939, 112: 681.

The author, in February, 1938, sent letters of inquiry concerning prostatic resection to all the fellows and active members of the American Association of Genito-Urinary Surgeons and to every tenth name included in the alphabetical roster of diplomats of the American Board of Urology. Over 95 per cent of these inquiries were answered and this article is a summary and digest of the first 100 replies received.

Of these 100 urologists, 21 are classified as resection extremists (those who perform resection in more than 90 per cent of their cases of prostatic disease) and 22 are prostatectomy extremists (those who do no resections or who resect only fibrosis, bars, and carcinoma, or those who do less than 20 per cent of their prostatic operations by transurethral resection). The remaining 57 per cent he classifies as "selectionists." Among these 100 urologists there were 8 who do practically all their prostatic operations transurethrally and 8 who do not use this method at all.

More than 80 of these urologists recognize both advantages and limitations of prostatic resection and favor selection of cases, as determined largely by the size of the gland. A skillful few, however, rather than fit the operation to the patient, have succeeded in fitting the patient to the surgeon.

The mortality rate and the functional results of transurethral resection bear a definite relationship to the skill and experience of the operator. The number of urologists who are tending to decrease their percentage of resections is distinctly greater than the number tending to increase this percentage.

Davis believes that transurethral resection, after passing through a typical trial and appraisal cycle, including both abuse and over-correction, is now approaching the final stage of stability, with a clearly defined field of usefulness.

THEOPHIL P. GRAUER, M.D.

Nesbit, R. M.: Transurethral Prostatectomy. *J. Am. M. Ass.*, 1939, 112: 687.

In this paper the author writes mainly of technical refinements in transurethral prostatectomy. He believes that serious sepsis in these cases is usually due to an introduced organism rather than an organism which the patient already harbors. In the author's practice a closed system of irrigation and drainage is used both in pre-operative catheter drainage and postoperatively, which is a distinct advantage as it decreases the introduction of infection.

In patients with urethral stricture or narrow urethras who require transurethral operation, the author, rather than traumatize the urethra too much, performs a perineal urethrotomy and inserts the instrument through the opening. Such an opening will permit the safe use of instruments considerably larger than those now used.

Nesbit advises rectal palpation during resection for accurate estimation of the amount of tissue which must be excised. Pressure exerted upward or medially by the finger also aids in bringing tissue into the path of the cutting loop.

A refined resectoscope has been devised so that the operator can now work entirely with one hand, leaving the other free to guide safely the excision of tissue by rectal palpation.

These refinements in technique have increased the scope of transurethral prostatectomy and have tended to decrease the limitations.

THEOPHIL P. GRAUER, M.D.

Thompson, W. O., and Heckel, N. J.: Undescended Testes. *J. Am. M. Ass.*, 1939, 112: 397.

Presenting an extensive bibliography, the authors give a critical analysis of the present status of glandular treatment of undescended testes and find a marked discrepancy in the percentage of successful results. They conclude from their work that it is important to maintain an open mind on the treatment of undescended testes with the pituitary-like principal (anterior lobe) since many of the reports appear to be overenthusiastic. Descent was produced in only 10 of 50 (20 per cent) undescended testes in 38 patients of all ages, as compared with an average of 61 per cent of successful reports in the literature. Descent did not occur in any of their cases in which the testes were intra-abdominal or deflected over the external oblique muscle.

In evaluating the effect of treatment, it is important to exclude all cases of pseudocryptorchidism. It is possible that this principle causes descent only of those testes which would descend without treatment about the time of puberty. The value of this form of treatment depends upon the importance of getting the testes into the scrotum as early as possible. If early descent is important, the management of cases of undescended testes involves the intelligent combination of medical and surgical measures, with discontinuance of the medical treatment before genital growth becomes excessive.

D. E. MURRAY, M.D.

Møller-Christensen, E.: Cryptorchidism and Its Treatment with Sexual Hormones (Ueber Kryptorchismus und seine Behandlung mit Sexualhormonen). *Acta path. et microbiol. Scand.*, 1938, Supp. 37, p. 301.

In recent times the problem of cryptorchidism is receiving greater consideration from the hormonal point of view, although for a long time this disturbance had awakened chiefly surgical interest. Operation was performed to establish, more or less successfully, normal relations, and to avoid possible complications. Other associated conditions, such as certain symptoms of sexual dyscrinism, were considered of minor importance in the reports and collective statistics. Occasionally authors turned their attention to these conditions: e.g. Schapiro, who found normally developed sexual organs only 5 times in 44 patients. He was the first to employ hormone treatment "with surprising success." The study of hormonal biology was first brought to prominence by Sand in 1918 by his experiments with cryptorchidism. It was shown that the artificially cryptorchid testicles degenerated considerably in from four to eight weeks. Spermatogenesis ceases while the Leydig cells are not affected or increased. This is attributed to abnormal pressure, also to the effect of temperature. The high abdominal temperature is harmful. If such testicles are restored to the normal position, the epithelium regenerates. The production of testicular hormone is said to be increased rather than diminished in cryptorchids. However, in the author's opinion, the production of testicular hormone is accomplished chiefly by the germinative epithelium. The principal sexual hormone center is the hypophysis. After removal of the hypophysis, degeneration of the seminal epithelium occurs. In artificially established cryptorchidism in rats, an increased quantity of gonadotropic follicular hormone was secreted. Descent was accomplished by the administration of Prolan B, which is found in large quantity in the urine of pregnant women. It is a hormone of luteinization, derived from the placenta but also present in the hypophysis. It would be expected that the treatment of cryptorchidism would be especially successful in those cases which present conditions pointing to a reduced or restricted production of testicular hormone.

Two groups of patients must be distinguished: Group I with retention of the testes but appearance otherwise normal; Group II with retention associated with infantilism, more or less obesity, and eunuchoidism. According to the present conception, Group II is especially, perhaps solely, eligible and suitable for the hormone treatment, and extraordinarily favorable results are reported from many sources. Most investigators have employed Prolan B, but a preparation containing both the hormone of the hypophysis and the testicular hormone is apparently more effective. Certain difficulties are experienced with the dosage. A daily dose of from 1,000 to 2,000 rat units is adequate. Boys from twelve to fourteen years are best adapted to the hormone treatment. The duration of the treatment is from a few weeks to a few months. Certain dangers such as premature development of the genitalia must be recognized in time if possible. The final result cannot be determined with certainty at present because the treatment is still too new.

For Group I operation is indicated, but hormone treatment may be employed first.

For Group II hormone treatment, as far as possible, should be given.

(Roedelius). J. M. Salmon, M.D.

MISCELLANEOUS

Ferguson, C., Buchholtz, M., and Gromet, R. Y.: Sulfanilamide Therapy in Gonorrhea. Review of the Literature and Report of 298 Cases. *Am. J. M. Sc.*, 1939, 197: 452.

The authors present an excellent review of the literature pertaining to sulfanilamide therapy in gonorrhea. Comparative charts of the methods of treatment, the results, and the complications encountered by various authors are correlated and compared with a series of 298 cases of acute and chronic gonorrhea as treated by the authors.

It was concluded that sulfanilamide has bettered the treatment of gonorrhea, but that older forms of therapy will continue to have a definite rôle. Large dosages were used in all the authors' cases (all hospitalized). The drug, as given (120 gr. daily for two days, followed by 60 gr. daily for three days, in divided doses at four-hour intervals, night and day), was rapidly excreted, and there was rarely a really dangerous reaction. Relatively few relapses, after apparent cure with sulfanilamide over follow-up periods, were reported. It is believed by the authors that inadequate dosage administered prior to an adequate dosage and course of sulfanilamide seems to impede the action of the drug and that local treatment does not seem to be warranted simultaneously with sulfanilamide. The reason for the failure of the drug in approximately 25 per cent of the cases is unknown, but certain seemingly pertinent inferences have been drawn.

D. E. Murray, M.D.

Shivers, C. H. deT., and Henderson, K. P.: A Clinical Study of 49 Cases of Urinary Calculi Requiring Surgery. *J. Urol.*, 1939, 41: 366.

The authors enumerate the clinical and chemical findings in their 49 cases of urinary calculi, and attempt to correlate the findings with the suspected causes. As possible causes they mention the possibility of metabolic factors, and an infection with or without obstruction. They did not find any increase in the blood calcium, or any decrease in phosphorus as evidence of hyperparathyroidism in 12 of their cases. Twenty-five patients in the series had infected teeth, 2 had advanced pyorrhea, and there were 4 with large infected tonsils. In 1 case the staphylococcus albus and the streptococcus were re-

covered from the root of a tooth and the staphylococcus was recovered from the left kidney, which contained a moderate-sized calculus. In another case a non-hemolytic streptococcus was recovered from the root of a tooth and from the right kidney, and a stone was found in the pelvic portion of the right ureter. However, the focal infection in the remaining cases did not correspond with the organisms cultured from the urine.

Renal calculi were found in 14 cases, all unilateral; stones were in the pelvis in 7 cases, branched calculi in 3 cases. Nine stones showed colon bacillus; 6 were found in acid urine, 2 in alkaline, and 1 in neutral. It was not possible to determine whether the infection found at examination preceded or followed the calculus formation. All patients showed definite improvement in back pressure following removal of the calculus. Nephrectomy was done in 1 case, nephrolithotomy in 4 cases, and pelviolithotomy with nephrostomy in 9 cases. No cases in which the stones were small were operated upon without first giving the stones an opportunity to pass following ureteral dilatation. In every case there was definite evidence of urostasis with infection.

Ureteral calculi were found in 7 cases, 6 of which presented infection from the bacillus coli, and 1 from the non-hemolytic streptococcus. Four cases showed weakly acid urine, and 3 strongly acid urine. All patients recovered promptly from the operations, and there were no recurrences in from three months to four years. The authors do not favor metal cystoscopic ureteral instrumentation for the removal of ureteral calculi because of pain to the patients before the calculi finally pass and because of the danger of injury to the ureteral wall which occasionally occurs. All foci of infection were cleared up either before operation or soon thereafter.

Vesical calculi were found in 26 cases, and all were associated with bacillus-coli infection. They were behind mechanical obstruction, with 2 exceptions. In 10 cases the urine was alkaline, in 9 acid, in 2 weakly acid, and in 5 neutral. This group of cases is divided into those found in the presence of adenomatous hypertrophy, contracture of the vesical neck, urethral strictures, and transvesical drainage. The authors believe that a certain number of these calculi were formed in the kidney, for some stones may slip down from the kidney without producing any marked symptoms. In 1 case a calculus was found attached to an unabsorbed suture in the anterior wall of the bladder with no obstruction to the vesical outlet or in the urethra. In none of the patients presenting calculi with obstruction in whom the obstruction was properly removed did the calculus recur, even though the infection was not entirely cleared up. In 2 patients in whom the stones reformed, some obstruction remained at the vesical outlet.

Urethral calculi were found in 2 cases and they have not recurred following dilatation or surgery.

Quantitative chemical analyses of the calculi were made of the dried powdered samples, for calcium, ammonium, phosphorus, uric acid, oxalic acid, and carbonic acid, by the adoption of microchemical methods used in blood chemistry in which as little as 50 mgm. may be used. Qualitative tests were made for the less frequently occurring constituents, such as cystine, fibrin, xanthin, and creatinin, which are found as impurities.

CLAUDE D. HOLMES, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Haberland, H. F. O.: Traumatic Osseous Tuberculosis (Die traumatische Knochentuberkulose). *J. internat. de chir.*, 1939, 4: 1.

The medical literature is so conflicting regarding the incidence of primary traumatic osseous tuberculosis, and even as regards the possibility of producing the condition experimentally, that Haberland is inclined to attribute the discrepancies in the results to uncontrolled sources of error (faulty hemostasis, improper splinting of experimentally produced fractures, and attempts to inoculate the human type of tubercle bacillus into animals). The author experimented on rabbits by means of intravenous injections of bovine tubercle bacilli, following surgically controlled fractures of the radius, crest of the ilium, and the ribs (including bone-implants), and did not succeed in a single instance in inducing primary traumatic osseous tuberculosis. He believes that unless the work of Bouquet and Laporti, who claim to have, by special methods, produced with some regularity blood-borne tuberculous bone infections, should prove to be revolutionary, the trend of medical thought will tend more and more toward regarding the development of a primary tuberculous process at the point of trauma to a previously healthy bone as only a bare possibility.

In this regard Haberland points to the beneficial and curative effects from grossly traumatizing operations on already existing osseous tuberculous lesions (bone-splinting of tuberculous hips and spines). He regards the reports of outbreaks of bone-tuberculosis at the point of accidental or operative trauma as lacking sufficient data (no roentgenogram at time of trauma), and explainable on the basis of the studies of Štefko. The latter reports finding, in 80 per cent of his cases of bone-tuberculosis, evidence of old foci, the condition in each case therefore being a secondary outbreak of a previously latent, primary tuberculous focus.

Since these foci of Štefko were situated mostly in the epiphyses, Haberland advises surgeons to keep away from the epiphyses, when possible, in operations involving the bony skeleton.

JOHN W. BRENNAN, M.D.

Arzelà, I.: Solitary Fibrous Osteodystrophy with Transformation of Sarcomatous Aspect Compared with Other Osseous Dystrophies (Osteodistrofia fibrosa solitaria con trasformazione di aspetto sarcomatoso in confronto con altre distrofie ossee). *Chir. d. organi di movimento*, 1939, 24: 197.

The diseases of Paget and of Recklinghausen are generalized fibrous osteodystrophies, the first showing a tendency toward reconstruction, while the second inclines toward destruction and is accompanied by hypercalcemia and adenoma of the parathyroids: the two diseases can be differentiated clinically, roentgenologically, and anatomopathologically. Multilocular localized fibrous osteodystrophy is considered a separate disease on account of its benign course, although it presents decided roentgen and histopathological similarities to Recklinghausen's disease. Solitary fibrous osteodystrophy differs from the other localized dystrophies through its peculiar and rare clinical and anatomical picture. Some authors consider giant-cell tumor, with regard to its relations with localized fibrous osteodystrophy, as an individual osteodystrophy, while others deny the neoplastic nature of the tumor but admit the possibility of its transformation into localized cystic osteodystrophy. A solitary osseous cyst must be distinguished from localized fibrous osteodystrophy according to some, while others insist on the impossibility of making a distinction between the two disorders.

Arzelà describes a case of solitary fibrous osteodystrophy in a girl aged eleven years: the only lesion found at roentgen examination was located between the middle and lower thirds of the right humerus, and was completely healed by emptying the cavity and filling it with two pieces of fatty tissue. Histological examination of the material obtained at operation showed transformation of the bone marrow into fibrous connective tissue, thinning of the cortex, and the presence of osteoid trabeculæ rich in osteoblasts and of large and numerous zones of fusiform cells which had assumed characters of sarcomatous aspect, and gave the general impression of the presence of an energetic process of hyperplasia.

The pathogenesis of all localized osteodystrophies is still uncertain; all have a benign course, although they may undergo real blastomatous or neoplastic transformation. Their clinical characters have only a relative value for differential diagnosis. Age (more than forty years) serves only to distinguish a secondary tumor from these disorders which always appear in younger subjects; pain is common to all, but the site of the lesion may give some information, as the giant-cell tumor occurs in the epiphysis, solitary fibrous osteodystrophy in the vicinity of the epiphysis, and all others in the diaphysis. Roentgen examination is of great importance and, although difficult, will usually help in the differentiation of all these osteodystrophies from malignant tumors. However, biopsy will solve the diagnostic problem; but, in order to be of decisive value, it must include superficial and deep material because osteogenetic sarcoma, giant-cell tumor, and localized fibrous osteodystrophy may show a similar fibrosis in their superficial parts. As a matter of fact, Vecchione insists on the necessity of inclusion in the biopsy of the healthy tissue, the limiting tissue of the tumor, and the neoplastic tissue itself for purposes of com-

parative study. Bloodgood recommends irradiation twenty-four or twenty-eight hours before biopsy in order to sterilize the neoplastic cells. Diagnostic irradiation of osseous tumors is recommended by the Paris Radium Institute.

The treatment of all localized fibrous osteodystrophies is the same: statistics show that conservative treatment is the method of choice; it consists in extensive opening and cleaning out of the cavity and filling it with transplants of living tissue, especially adipose or muscular tissue. Radical intervention may be advisable in recurrences, or when the continuity of the bone cannot be preserved. Some authors recommend radiotherapy as the only treatment, others give postoperative irradiations.

RICHARD KEMEL, M.D.

Jones, S. G.: Volkmann's Contracture. *Am. J. Surg.*, 1939, 43: 325.

It is important to recognize and remember that Volkmann's ischemic contracture can be prevented. Fasciotomy performed early gives this opportunity. Prevention is more important than treatment. Once contracture has developed, conservative treatment is indicated. Muscles that have become fibrosed and contracted cannot be fully restored. The more severe cases may be partially benefited by plastic surgical procedures.

Experimental work on animals has borne out the observation that obstruction of the circulation alone does not cause the contracture. It has long been accepted that obstruction of a main artery in an extremity causes dry gangrene with flaccid paralysis; obstruction of a principal vein results in wet gangrene. Ligation of the vessels of an extremity has produced flaccid paralysis with or without gangrene. Trauma to nerves also results in flaccid paralysis with lengthening of the muscles at times, but never fibrosis and contracture.

It becomes evident that there is something more than circulatory and nerve disturbance in the production of Volkmann's contracture. That added factor is extrinsic or intrinsic pressure. Pressure follows an injury to the elbow region associated with a supracondylar fracture. Pressure impairs the arterial and venous circulation. Pressure, plus the infiltration of the tissues with blood, results in ischemic necrosis. Hemophilia alone has caused Volkmann's contracture.

The pressure may be extrinsic, such as results from wooden, metallic, or plaster-of-Paris splints applied too tightly; or intrinsic, resulting from too acute flexion of a swollen elbow or pressure from a subfascial hematoma. The result is the same. Pressure impairs the circulation, directly injures the tissues, and results in fibrosis and shortening.

The anatomical structure of the forearm and elbow favors the production of Volkmann's contracture. The forearm and elbow are encased in a firm, resisting fascial envelope. Hemorrhage within this envelope cannot escape and tremendous pressure results. Furthermore, in certain cases, the anatomical structure of the region contributes an added factor. The bicipital fascia crosses the elbow joint and is firmly attached to the biceps tendon and flexor muscles of the forearm. The brachial artery lies directly beneath this fascia which may be put under great tension by intrinsic hemorrhage, edema, and swelling of the tissues.

In the past, there has been considerable argument as to whether obstruction to venous outflow or impairment of arterial circulation was the cause. There is no question but that there is some obstruction to venous outflow. As pressure increases, due to extravasation of the blood and serum with swelling of the soft structures, the veins, being more readily compressed, are affected first. There certainly is an unyielding fascia. As pressure is further increased, obstruction of the arterial circulation occurs. This obstruction may be due either to actual arterial damage or to interruption of the arterial flow from intrinsic pressure on the artery. In most instances, a combination of a few or all of these factors brings about a disintegration of the soft tissues due to pressure, hematoma, and anemia.

The best preventive against development of Volkmann's contracture is accurate reduction of the supracondylar fracture. If, in addition to a faulty reduction, the elbow is placed in a too acute flexion position, if too tight bandages or splints are applied, or if a hematoma develops in the antecubital space, paralysis and contracture may develop. Roentgenograms are imperative to make sure displacement has not occurred and frequent observations of the hand for color, temperature, and the condition of the radial pulse are necessary. Coldness, color change, numbness, loss of muscle power in the flexor muscles, and absence of the radial pulse constitute an indication for fasciotomy. This is true especially if there is in addition, a painful, swollen elbow with evidence of hematoma in the antecubital space. The reviewer has attributed some value to the rather marked tenderness upon light pressure over the flexor muscles of the forearm and complaint of pain in them upon voluntary or passive motions of the fingers—signs indicating a fasciotomy.

Absence of the radial pulse alone does not constitute an indication for operative interference. The radial pulse will sometimes become palpable by decrease of the flexion at the elbow or it may be congenitally absent. The use of a Kirschner wire through the olecranon to maintain reduction is a dangerous procedure because valuable time is lost. The damage is done early, certainly during the first few hours, in an impending case of Volkmann's ischemic contracture. If the fasciotomy is performed early, it relieves the pressure beyond doubt. An incision is made on the flexor aspect at the elbow over the hematoma, just medial to the biceps tendon. The fascia is opened widely. Muscle tissue and blood which have been under great tension will be liberated. In certain cases, the bicipital fascia will be found to be under great tension, and exerting tremendous pressure upon the brachial artery which

passes beneath it. This fascia is incised. The artery, vein, and nerve may be observed to ascertain the presence or absence of injury. The fascia is left open, the skin being loosely sutured. A posterior molded plaster splint is applied and the arm is elevated upon a pillow. As one becomes more accustomed to the anterior approach, it is often possible to reduce the fracture through the fasciotomy wound.

The author calls attention to the dangers of malpractice suits in these cases and advises consultation. The consultant should determine accurately the severity of the injury, the time interval between injury and consultation, and the treatment given in order to protect both his own and the physician's interests. Volkmann's contracture occurs also in the absence of splints or tight bandages.

The conservative and plastic operative treatment of Volkmann's ischemic contracture in its different stages of duration and severity are discussed. Case histories emphasizing certain points in judgment regarding what treatment should be pursued, photographs, drawings, and roentgenograms are presented.

ROBERT P. MONTGOMERY, M.D.

Sassen, W. von: Tuberculosis of the Trochanter Major and of the Bursæ in the Neighborhood of the Trochanter (Die Tuberkulose des Trochanter Major and der Schleimbeutel der Regio trochanterica). *Beitr. z. klin. Chir.*, 1938, 168: 594.

Six cases of tuberculosis of the trochanter major have been observed during the last ten years in the Koenigsberg Clinic. In the German literature this disease is considered to constitute only a small percentage of the total bone and joint tuberculosis, by Pacini and Zangheri 1.07 per cent of the total, and by Sven Johansson 2.33 per cent. Four of the patients whose detailed histories are available were treated by operative exposure of the neighborhood of the trochanter, and removal of the diseased bursæ, bone, and muscle parts. Early diagnosis is essential, and it should be remembered that tuberculosis of the trochanter is most prevalent in the second and third decades of life. Authors are divided as to the point of origin of the tuberculosis, whether it occurs first in the bone or first in the bursa. One author states that in 3 of his cases it was undoubtedly in the bursa as the roentgenogram showed only slight changes in the bone although the disease was of long standing with fistula formation. In another case, however, he regards the bone as the place of origin of the tuberculosis, because soon after the onset of the disease there was widespread destruction of the trochanter.

Roentgenologically, tuberculosis of the trochanter is characterized by cyst-like transparent areas in the bone, irregular cortical markings, sequestration in the neighborhood of the bone, and by small pieces of cortex becoming detached by muscle pull. In general, tuberculosis of the trochanter and of the bursa shows only a little propensity to progress, yet 3 cases are cited in which, through spreading to the hip joint, the disease produced great danger to the patient. According to most authors the treatment demands the widest possible removal of all diseased tissue. If treatment is started at the beginning before too great extension of the disease, the average case should proceed to healing in two or three weeks.

(KEMPF). HAWTHORNE C. WALLACE, M.D.

Hauser, E.: Muscle Imbalance of the Foot. *Surg. Clin. North Am.*, 1939, 19: 101.

The author's discussion on muscle imbalance of the foot falls under three general headings. The first group of cases are those in which the muscles acting on the foot are called upon to do more work than they can carry out. This occurs when the individual stands or walks strenuously, or for an abnormally long time, or when there is a disproportionate increase in the body weight. When muscles are weak as a result of brief or prolonged invalidism or the wearing of deforming shoes, a similar overwork of muscles ensues.

A second type of foot imbalance occurs when power is lost in one group of muscles, while the opposing group retains its power. This may occur in anterior poliomyelitis or peripheral motor-nerve injuries, and often results in contractures of the stronger group.

A third type of muscle imbalance develops secondary to a persistent deformity. The displacement of the Achilles-tendon insertion laterally, which occurs in persistent valgus deformity of the heel, gives the calf muscles a lateral component of force supplementing the strength of the pronators of the foot In hallux-valgus deformity, the rotation of the great toe results in displacement of the insertion of the abductor hallucis muscle plantarward and laterally, and thus removes it as an opposer, the muscles tending to displace the toe laterally. This latter group is induced to assume the hallux-valgus deformity also by an additional lateral component of force resulting from the lateral displacement of the insertions of the long flexor and extensor hallucis muscles, the tendons of which come to lie lateral to their normal positions.

Three case reports are included. In the first case, in which there was simply "functional decompensation," the patient was treated conservatively. She was given corrective shoes with a "straight inner sole, a low, broad heel, thick leather sole, and no metal shank." These shoes were padded with felt insoles. External corrections were added subsequently; they consisted of an anterior bar with inclined plane which tended to pronate the forefoot, and inclination of the plane of the heel, for supination of the hind foot, with anterior extension of the heel under the shank. During these corrections, the gait and posture of the patient were improved. Padded conventional women's shoes were worn when fashion compelled it. Relief from pain resulted.

In the second case, an equinovarus deformity of one foot was noted when the patient first walked. She was seen by the author when she was eighteen years old. The anterior tibialis, the quadriceps,

and the peroneal muscles on the affected side were weak. The author describes the surgical treatment with a manipulative footboard and tourniquet followed by tenotomies and plantar fasciotomy. A recurrence was treated by stabilization operations upon the midtarsal and subastragalar joints and an original tendon transplantation devised by the author.

In the third case, the author treated a hallux-valgus deformity by resection of the projection on the head of the first metatarsal and transplantation of the displaced insertion of the abductor hallucis muscle medially. Circulation of the foot was improved with Unna's paste boots and shoe corrections were instituted. ROBERT PORTIS, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Petit, P.: The Treatment of Acute Osteomyelitis in Adolescents (Le traitement de l'ostéomyélite aiguë des adolescents). *Presse méd.*, Par., 1939, 47: 284.

In recent years the principles of treatment of acute osteomyelitis in adolescents have again come up for discussion, especially as regards new or revived surgical methods. Most French surgeons have adopted Lannelongue's rule of immediate trepanation in all cases, and but few advocates of simple incision of the abscess, as recommended by Kirmisson in 1907, have appeared. In consideration of the various clinical forms of osteomyelitis it seems logical to conclude that no one rule of treatment could apply to all. Individualization of treatment and a thorough knowledge of the advantages and disadvantages presented by the different methods in use form a prerequisite for improvement in results. The value of incision, trepanation, and subperiosteal resection, respectively, is discussed in detail by Petit.

In the great majority of cases of acute osteomyelitis simple incision of the periosseous abscess gives good results, though in numerous instances puncture will suffice, and in still others prolonged immobilization will lead to spontaneous resorption. Simple incision is indicated in cases of abscess of superficial bones such as the tibia, but in deeper abscesses, as for instance those of perifemoral location, diffuse edema of the soft parts obscures the findings so that the question of where and when to incise cannot be determined. In such cases it is necessary to await more definite signs of localization. Trepanation is a more serious intervention accompanied by considerable shock. It permits only inadequate drainage or incomplete removal of the infectious foci. Furthermore this operation may lead to spread of the infection to normal bone-marrow from the subperiosteal abscess and favors dissemination of bacteria into the general circulation. The mortality rate following trepanation was twice as great as that following simple incision as a routine procedure, and the incidence of complications and metastases was likewise doubled. Thus, exclusive of cases of deep central abscess of the bone, trepanation is contraindicated in osteomyelitis.

Subperiosteal resection is a much more satisfactory method. It involves complete removal of the infectious focus and thus insures rapid cure and prevention of a protracted course of disease with resulting complications. In "early" resection the bone is removed before sequestration, while the periosteal sheath is still elastic and non-adherent, during the first weeks of febrile osteomyelitis. This early resection may be primary or secondary, corresponding to whether it is the first treatment applied or follows earlier unsuccessful treatment. "Late" resection is that practiced at a time when the necrotic bone is surrounded by a sheath of new bone. The periosteum is more or less adherent to this new bone. The writer believes that only early resection is justifiable because it alone guarantees a satisfactory regeneration of bone. The technique is described in detail. Whatever method is used, drainage and gauze tampons should be avoided. Although benign in themselves, these operations may involve serious shock to debilitated patients and should for this reason be preceded by a blood transfusion. The latter may also be performed during operation.

Once resection is completed, strict immobilization is indicated. A bivalved plaster cast made before operation permits placing of the limb in a perfectly correct position in the cast after operation. In resections of the femur or tibia, the knee should be immobilized in semi-flexion to avoid fixation in an improper position. The plaster and dressing should not be removed or renewed for at least a month, in spite of the unpleasant odor which may arise. The course of the temperature will offer a sufficient guide as to the condition of the focus. As a rule the results of this operation are excellent with marked improvement in the general condition and subsidence of the symptoms within a few days or even on the day following operation. At the end of a month regeneration of bone is usually far advanced and by the fortieth day it is completed. The new bone gradually assumes normal shape. Fractures of such new-formed bone heal in normal time. Wedge-like resections of this regenerated bone for cosmetic purposes will not cause a flare-up of inflammation or retard consolidation at the site of osteotomy.

Although failure of previous treatment usually presents the indication for resection, the cases of primary resection are increasing. However, very early primary resection is to be discouraged as it constitutes a blind procedure, and is as harmful as premature incision in cases of staphylococcic infection elsewhere. Resection of a diaphysis should not be attempted until the patient is apyretic. Secondary early resections are indicated when the inflammatory symptoms persist and threaten the life of the patient; their extent may be determined roentgenologically. In such cases all diseased but no normal bone should be resected in the presence of fever or pus, and one should not delay until prolonged suppuration has destroyed the periosteum.

Petit recommends immobilization in a plaster cast with constant observation every day of the general condition and variations in temperature; blood analyses, too, must be made regularly. The findings will be a guide as to the proper time for intervention. Immobilization has a beneficial effect on the general condition; the temperature becomes more normal and the toxic symptoms disappear. In cases with positive blood cultures, the organisms usually disappear from the blood before the temperature becomes normal. Within a few hours the relief from pain transforms the patient. By such expectant treatment septicopyemia may be prevented. In a few days the general disease is transformed into a local process, an ordinary suppurative focus, to be treated as such. The course of the latter is much more frequently benign than hitherto supposed. The abscess which forms should be evacuated, after subsidence of the symptoms, by simple incision without drainage, followed by interval dressings without removal of the plaster cast.

In cases in which the local inflammation does not subside following incision of the abscess, the osseous focus should be removed by subperiosteal resection, but only after elimination of other foci of suppuration. If performed during a period in which the infection is strictly limited to the bone, such secondary early resections will be followed by excellent results. Bone regeneration is satisfactory. By adapting the form of treatment to the general and focal findings, suppurative arthritis may be prevented. Joint effusions have often collected before immobilization. They are either rapidly resorbed or may be drained by one or two punctures. True suppurative arthritis most frequently follows lesions of the metaphysis and epiphysis at the cartilaginous junction, which has been partially destroyed. Prompt diaphyseal resection affords the best prophylaxis. In cases of articular suppuration, arthrotomy will not suffice. An associated evacuation of the bony foci is indicated with resection of the metaphysis and of the involved epiphysis through the perforation in the cartilaginous junction. This procedure is preferable to simultaneous resection of the diaphysis and epiphysis because removal of the cartilage will definitely inhibit the growth of the involved limb.

EDITH SCHANCHE MOORE.

Pacini, D.: Late Picture of Arthrodesis of the Hip in Coxitis. Evolution of the Graft; Focal Changes (Il quadro tardivo dell'artrodesi dell' anca nella coxite. Evoluzione dell'innesto, modificazioni focali). *Arch. ital. di chir.*, 1938, 49: 619.

Of 85 extra-articular arthrodeses performed for coxitis at the Marine Hospital of Valdoltra, Pacini has verified the results obtained in 41 after a lapse of time varying from three to eight years dating from the operation. The age selected as appropriate for the operation ranged from twelve to fifty years, the latter being subsequently changed to forty.

Extra-articular arthrodesis is effective in the cure of coxitis and is indicated during the stage of repair of the disease and for its sequelæ; it does not replace or shorten the long period reserved for stimulation therapy which, in association with the strict immobilization of the involved joint, raises the defensive powers of the organism. When the operation is performed during the beginning of the stage of repair, it accelerates the process of healing, and thereby shortens somewhat the course of the disease; it allows early removal of apparatus during the stage of convalescence and affords greater assurance of cure.

The operation is indicated especially in the following sequelæ of coxitis: intra-articular and extra-articular pseudarthrosis; painful rigidity; non-progressive recurrence of the cold type (opening of fistular sinuses which discharge very little, contractions, painful crises, and early fatigue on getting up), or chronicity of the process due to the deficient residual movement of the joint; contraction of the extremity in flexion and adduction after clinical healing of the process in adults. It has been proved that in children and adolescents the operation performed to correct a vicious attitude of the extremity falls short of the desired results.

The arthrodesis favors intrafocal bony ankylosis. This mode of repair has been shown to occur more than twice as often in cases treated in this manner as in those treated without surgery. Among the various methods proposed, the extra-articular drawbridge method gives the best results with rapidity of fusion and hypertrophy and shows the smallest number of failures. This operation is indicated especially in children up to the age of eighteen years. In adults, the insufficient elasticity of a pedicled iliac flap makes it advisable to use an extra-articular tibial-graft transplant.

In all cases in which the iliac flap was used, it was cut to a width of at least three fingerbreadths to ensure its solidity and rigidity. After initial decalcification of more or less intensity, according to whether the iliac flap or a transplanted graft was used, uniform recalcification occurred and the ends of the graft fused with the structure of the pelvis and of the great trochanter, acquiring, in the roentgenogram, the density of the surrounding bone and a regular trabeculation.

RICHARD KEMEL, M.D.

FRACTURES AND DISLOCATIONS

Cubbins, W. R., Callahan, J. J., and Scuderi, C. S.: Compound Fractures of the Elbow Joint in Adults. *Am. J. Surg.*, 1938, 42: 627.

The custom of driving an automobile with the left elbow protruding from the car window has produced an increasing number of severe, compound comminuted fractures involving the elbow joint.

The treatment of the wounds in these injuries is the same as employed in other compound fractures. The wound is covered with a sterile gauze and the surrounding skin is cleansed with soap and water. Soap, water, and normal salt solution are used to cleanse the wound and wound edges. No antiseptic solutions are used. All avascular tissue, dirty wound

edges, and separated dirty bone spicules are excised and removed. If dirt is deeply impregnated into a bone fragment it should be removed with a chisel or rongeur. The wound is then irrigated with a large quantity of saline solution and sutured loosely. Dry dressings are applied and changed every six hours during the first two days so as to obtain the maximum capillary drainage and to prevent fermentation. When extravasation of serum decreases sufficiently, the dressings may remain unchanged until the sutures are removed. Using this method of treatment the authors have recorded 91 per cent clean wounds regardless of the extent of injury.

If in all extensive compound fractures involving the elbow joint, or anywhere else, antitoxin for gas bacillus and tetanus infections is given early and in curative doses of 20,000 units of polyvalent gas antitoxin and 5,000 units of tetanus antitoxin, there will rarely be an infection with either of these organisms. In those cases with compound fractures about the elbow that are complicated by a gas-bacillus infection, from 150,000 to 200,000 units of polyvalent gas antitoxin are given and the wound is enlarged until it is possible to make a complete débridement of all gas infected tissue. Potassium permanganate crystals are then placed in the wound and hydrogen peroxide may be used locally. Following the operation, a potassium-permanganate solution of 1:3000 is used and is alternated every six hours with hydrogen-peroxide irrigations. The dressings are changed frequently and a heat cradle is placed over the wound to keep the temperature at 100° F. This régime is followed until the temperature of the patient has lowered considerably and there is improvement in the local lesion. The authors state that they have never been required to amputate an arm for any infection and this covers a period of thirty-six years for one of the writers. They feel certain that roentgen therapy for gas-bacillus infection has little if any value. In the 8 cases of proved gas-bacillus infection that were treated with roentgen-rays without surgery or antitoxin, there were 8 deaths.

In compound comminuted fractures of the distal end of the humerus where several combinations of fractures may occur, an ordinary hook screw is inserted into the flat portion of the ulna, in adults, which is about 1½ in. distal to the proximal end of the olecranon. Five to ten pounds of weight are attached to the hook screw and the forearm is supported by adhesive or skeletal traction. The advantages of the hook-screw traction over the use of the Kirschner wire is that the ulnar nerve cannot be injured, the procedure of insertion is simpler, and there is more stability and no slipping.

Compound comminuted dislocations of the elbow are reduced and fixed in slight flexion in plaster molds which are applied in such a manner so as to avoid any pressure on the open wound. If lacerations are extensive, a circular cast is used.

Lateral traction, by means of a band of saddlers' fet applied to the forearm with the elbow flexed 90 degrees and the forearm in full supination, is used in fragmented or compound fractures of the ulna in which metal traction is contraindicated.

In compound fractures of the radial head combined with a compound fracture of the olecranon and dislocation of the radial head, a silk suture is threaded through a transverse drill hole in the proximal end of the distal ulnar fragment and through the triceps tendon at its insertion into the olecranon; the ulnar fragments are then apposed. Only the fragments of the radial head that are completely separated are removed. Removal of the entire radial head is not advisable because of subsequent angulation at the elbow and pain at the distal radio-ulnar joint due to downward protrusion of the ulnar styloid.

In comminuted fractures of the lower end of the humerus and the proximal portions of the ulna and radius, metal fixation is seldom used because of the danger of an increase in the frequency of infection. Silk or catgut is much better tolerated. Chrome plated steel screws are used occasionally in T-shaped fractures of the humeral condyles.

Slight malpositions as seen in the roentgenograms should not be overemphasized and used as a basis for changing the positions of the fragments.

All force should be avoided in mobilizing an injured elbow. Forced motion under general anesthesia is definitely contraindicated. Carefully controlled active and passive motions in the elbow should be started early. These can be started with the hook-screw in the olecranon. The maximum amount of motion in the elbow is rarely obtained in less than one year following a compound comminuted injury. ROBERT P. MONTGOMERY, M.D.

Gherlinzoni, G.: The Mechanism of Production of Fractures of the Lumbar Transverse Processes (Sul meccanismo di produzione delle fratture delle apofisi trasverse lombari). *Chir. d. organi di movimento*, 1939, 24: 255.

Gherlinzoni reports 5 cases of fracture of the lumbar transverse processes due to striking the lumbar region or the involved side during a fall on an icy street, on the edge of a toboggan slide (3 cases), and in a motorcycle accident, and recalls the data of normal and pathological anatomy and physiology of the lumbar region. The frequency of fracture is in direct relation to the length of the processes, the third process being most often involved. The fracture occurs usually in the middle and distal parts of the process and the line of fracture is slightly oblique from above downward and from inside outward. The position of the fragment is generally good, but it may be displaced upward or outward, seldom downward or inward. According to most authors, the greater frequency of fractures of the lumbar transverse processes, compared to those of the cervical and thoracic regions, is due to the length, thinness, and fragility of the processes, their transverse direction and the distance separating them, the insertion of strong muscular bundles on them, and their relatively poor protection against external violence.

As to the mechanism of production of the fractures, the opinions of the authors differ, some accepting the direct action of the traumatism, some denying it, and some defending an indirect mechanism by muscular contraction. Undoubtedly, the question often remains unanswered because of the lack of precision in the anamnesis, in which cases it is easy to attribute the fracture to indirect action; on the other hand, cases have been reported in which the indirect action cannot be denied, and often the obscure modality of the traumatism does not allow clear determination of the mechanism. However, this does not apply in the present clearly cut cases of persons falling violently and striking the lumbar region or the side on the edge of a step, on the edge of a toboggan slide, or on the ground. Besides, it is well known that the movements of torsion of the spine, which are inevitable and instinctive when a fall is imminent, place the transverse lumbar processes in a more superficial position and consequently expose them more to the traumatic action; while their length, separation, and transverse direction, added to the mobility of the spine, facilitate injury by direct action, which probably occurs more frequently than is generally accepted, even in cases in which the patient falls with his back flat on the ground. The upward displacement of the broken fragment is also in favor of a direct action. Ecchymosis in these fractures, no matter what their mechanism of production, is usually late and of little value in determining the mechanism, but it always occurs and is often located retroperitoneally, along the aponeurosis of the iliac psoas: the irritation it causes may give rise to nervous disturbances. The direct traumatism usually does not involve the kidney because it is well protected by its position and by the anatomical elements which surround it.

RICHARD KEMEL, M.D.

Tinker, M. B., Tinker, M. B., Jr., Kerr, A. T., and Sawdon, W. M.: Fracture of the Neck of the Femur. *J. Am. M. Ass.*, 1939, 112: 791.

The authors present statistics derived from the recent literature on the treatment of fracture of the neck of the femur, and from questionnaires sent to physicians residing within a hundred miles of their city. Two thousand and seventy-four cases were collected from the literature and 573 from the questionnaires. More than half of the cases from the literature were treated conservatively, most of them by the Whitman plaster spica after reduction. The average percentage in which bony union was obtained was 51 per cent. In most of the remaining cases, which were treated by open operation, internal fixation methods were used, and bony union was stated to have occurred in 78 per cent. The results from the questionnaires showed that the Whitman plastic spica after reduction, simple Buck's extension, and simple bed rest with or without sand bags, each, were resorted to in about one-third of the cases. Few attempts at internal fixation were made. Buck's extension and Whitman plasters after reduction gave good results in about 50 per cent of the cases. The uthors present a device to aid in the insertion of 3 Austin Moore nails for internal fixation.

ROBERT PORTIS, M.D.

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD; TRANSFUSION

Heinild, S.: Observations on Essential Thrombopenia (Morbus Maculosus Werlhofii). *Acta med. Scand.*, 1939, 98: 385.

The author defines essential thrombopenia as a non-familial disease of unknown origin. It is characterized by spontaneous hemorrhage of the skin and mucous membranes. Examination of the blood reveals a greatly lessened platelet content, a normal coagulation time, and an absent or prolonged clot retraction. The red and white cells are normal in their quantitative and qualitative conditions except for a simple hypochromic anemia due to excessive hemorrhage. The bleeding time is prolonged and the capillary resistance always decreased.

The acute form may, in certain cases, take a lethal course within a few weeks. The chronic form usually lasts several decades and occurs in from 75 to 90 per cent of the cases. The chronic form has a typical intermittent course. Women are more often affected than men. The first manifestations often appear at the time of puberty or the climacteric.

The author divides thrombopenic conditions into four main groups:

1. Essential thrombopenia, in which the etiology is unknown. Deficiency of the capillaries is an important factor in this type.

2. Symptomatic thrombopenia, which seldom has a dominating symptom, but occurs in many cases of acute infectious diseases or intoxications. It is found in non-treated cases of pernicious anemia, aplastic anemia, in certain cases of leucemia, and with metastatic tumors of the bone marrow.

3. Thrombopenia caused by anaphylactic hypergic processes. This type might possibly be regarded as a symptomatic thrombopenia, but it differs from that type in its characteristic origin and the absence of severe alterations of the bone marrow.

4. The hypersplenic thrombopenia. Examples of this group occur with diseases such as Banti's and Gaucher's diseases, and with hyperplasia of the spleen in malaria and lymphogranulomatosis.

The records of 6 patients are presented in detail by the author, 1 patient having the acute and 5 the chronic type of thrombopenia. The author reports and presents his conclusions relative to examinations of the bone marrow, the hormonal conditions, the plasma proteins, the blood cholesterin, and the serum ascorbic acid. He concludes that no parallelism can be proved between the quantity of the megacaryocytes in the bone marrow and the thrombocytes of the peripheral blood in cases of essential thrombopenia. Nor has it been possible to prove qualitative characteristic alterations of the megacaryocytes.

The number of thrombocytes in the peripheral blood is undoubtedly influenced by the hormones; the exact relations concerning these facts are still unknown. However, it seems quite probable that the disturbance of hormone balance at the time of the menopause under certain conditions may dispose to thrombopenia. The thrombopenia is probably not caused by the cessation of folliculin production; hypothetical considerations as well as experimental examinations prove that folliculin is of no value in the treatment of essential thrombopenia.

Numerous examinations recorded in the literature indicate that in a large number of conditions a well pronounced parallelism exists between the increase of fibrinogen and globulin in the plasma and the increase of the number of blood platelets in the peripheral blood. Examinations made by the author reveal that no definite state of dependence exists between the plasma proteins and the blood platelets. Five cases of essential thrombopenia with considerable reduction of the blood platelets showed no variation in the plasma proteins; fibrinogen and globulin, especially, are always found in normal values. Additionally, normal numbers of blood platelets were found in the 2 cases of hypoproteinemia, and 1 case of hyperproteinemia showed a reduction in the number of platelets.

Normal values of blood cholesterin were found in 5 cases of essential thrombopenia. It is asserted that no condition of definite dependence exists between the content of cholesterin in the blood and the capillary resistance. Patients with essential thrombopenia have, even if they take apparently sufficient food, a spontaneous content of serum ascorbic acid below the normal values for the period concerned. Treatment with ascorbic acid succeeded in producing an increase of the values in all cases. The number of thrombocytes was not influenced; however, the capillary resistance was increased to a certain extent, but never reached the normal standard.

In his consideration of the anti-hemorrhagic vitamins, the author notes that some workers have found an increase of thrombocytes because of the effect of sesame oil (or a vitamin, the T-factor, contained in the sesame oil), but it has been impossible to confirm this effect in the 4 cases of essential thrombopenia recorded here. There is no reason to suppose that Vitamin K should be of any importance in the treatment of essential thrombopenia, since the coagulation time has been investigated by special determinations. The author points out that the examinations made by several contemporary workers, as well as his personal examinations, show that decrease of capillary resistance is a dominant factor in the clinical course of thrombopenia. Stryphnon, which is derived during the production of adrenalin, may improve this deficiency of the capillaries to a certain degree. The deficiency of the capillaries seems to bear a closer relationship to the clinical condition than the degree of thrombopenia. Moreover, the

deficiency of the capillaries is a constantly present abnormality of fundamental importance in this disease because its degree of severity coincides with the clinical manifestations.

In a discussion of splenectomy, this writer states that the good effect seems due more to the improved function of the capillaries than to any increase in the number of platelets. He concludes that the examinations reported herewith show that conservative treatment when consistently effected may cause a considerable improvement in the function of the capillaries, and, consequently, improve the condition of the patient. HERBERT F. THURSTON, M.D.

Page, A. P. M., Seager, K. G., and Ward, E. M.: The Use of Placental Blood for Transfusion. *Lancet*, 1939, 236: 200.

The details for the collection of placental blood which is to be stored and used for transfusions is outlined. Blood is not taken when there is any transmissible disease, premature labor, multiple pregnancy, or when the membranes have been ruptured for forty-eight hours. Sodium citrate in saline solution was used as the anticoagulant and preservative. In order to determine the presence or absence of anemia in babies whose placentas had been drained, blood counts were taken on the first, second, seventh, and thirteenth days and were found to be the same in 12 babies whose placentas had been drained as in 12 babies used as controls.

The average yield of blood was 80 c.cm., which corresponds to about double this amount of adult blood. Fifteen cultures showed only 1 which was contaminated and this with staphylococcus albus. A change in the personnel of the delivery room resulted in 3 contaminated specimens out of 5 taken.

The authors believe that the sterility depends entirely upon the strict adherence to the technique described. The authors do not warm the blood routinely before administration since they believe over-warming may account for temperature rises following the giving of the blood. In 25 transfusions 1 severe reaction developed. Storage for over one month has resulted in minimal hemolysis.

THOMAS C. DOUGLASS, M.D.

LYMPH GLANDS AND LYMPHATIC VESSELS

Monteiro, H.: Lymphangiography *In Vivo*. A Description of the Method, Results, and Indications (La lymphangéiographie chez le vivant. Méthode, résultats et applications). *Bruxelles-méd.*, 1938, 19: 205, 242.

The substance used for the visualization of lymphatic vessels should meet the following requirements: (1) it should not be toxic; (2) it should not irritate the endothelium; (3) it should produce a considerable opacity, and (4) it should be able to penetrate the lymphatic reticulum. In spite of the fact that thorotrast has been condemned in the United States and France on account of its cancerogenic action, its radioactivity, its storage in the reticuloendothelial system, and its harmful effects on the hematopoiesis, the author employed the substance for visualization of the lymph vessels because only minimal doses were required. From 4 to 5 c.cm. of the fluid are sufficient to produce an image of the iliofemoral vessels and the entire thoracic duct in dogs weighing from 10 to 15 kgm.

The technique employed was that described by Gérota for the visualization of lymph vessels in cadavers. The experiments were performed on guinea pigs, rabbits, cats, and dogs. According to the site of the injection, the lymph vessels in various regions, such as the neck, testicles, and iliofemoral area, could be demonstrated.

As Leriche showed the favorable influence of sympathectomy on the re-establishment of the arterial circulation, the author studied the question whether section of the sympathetic nerves has an identical influence on the re-establishment of the circulation of the lymph.

In a preliminary series of experiments the re-establishment of circulation after ligation or section of the lymph vessels was investigated. The method of lymphangiography clearly demonstrated the formation of new anastomoses or reconstruction of the severed vessels. The author was able to show that a sympathectomy facilitates the re-establishment of the lymph flow through the thoracic duct after its interruption. This effect is due to a larger number of anastomoses and improved nutritional conditions in the connective tissue.

In another series of experiments the re-establishment of the lymph circulation after the removal of glands was studied. A dilatation of the pre-existing lymph capillaries with a resulting insufficiency of the valves and a retrograde lymph flow could be demonstrated. Finally, the success of an autoplastic transplantation of lymph glands in young animals could be clearly shown in lymphangiograms.

The method of lymphangiography can be supplemented by injection of a 4 *per mil* solution of indigo carmine into the lymph follicles or peripheral reticulum. In this manner the lymph vessels can be seen at operation.

Visualization of the lymph vessels should interest not only the anatomists and physiologists but also the clinicians, particularly students of cancer.

JOSEPH K. NARAT, M.D.

SURGICAL TECHNIQUE

OPERATIVE SURGERY AND TECHNIQUE; POSTOPERATIVE TREATMENT

Brandis, H. J. von: The Relationships Between Heat Economy and Surgical Intervention in Man (Ueber die Beziehungen zwischen Waermehaushalt und chirurgischem Eingriff beim Menschen). *Arch. f. klin. Chir.*, 1938, 192: 245.

This interesting article first treats of the general aspects of the chemical and physical regulation of heat. There is a difference between the heat produced by muscular activity and the absorption of food, which is immediately lost, and the chemical heat tonus, concerning which there is no available information in man. Whereas the chemical regulation concerns the development of heat, the physical regulation concerns the loss of heat. About 90 per cent of the loss of heat occurs through the skin and also through the lungs. Heat formation and loss are associated most intimately with the circulation, the metabolism, and the nervous system. In regard to the latter there are supposed centers in the region of the medulla oblongata and in the midbrain, and especially in the corpora quadrigemina and the tuber cinereum. During sleep the body temperature normally falls from 1 to 2 A.M., parallel with a measurable limitation of the basal metabolism. Von Brandis was able to confirm this. He was unable to determine, however, the changes in temperature in the skin, observed by Ipsen and Kirk, which occurred upon falling asleep or awakening. The onset of sleep is associated with a definite body heat.

In discussing the heat economy and surgical intervention, the circulatory relationships and their changes as a result of anesthesia and surgical shock are explained, but the relationships of the heat economy are not, as yet. Starlinger, Rech, Voss, Watkins, and Wilson have shown that with ether and chloroform anesthesia there is a fall in temperature, whereas with local anesthesia there is usually a rise in temperature. Shortly after the onset of a general anesthesia, Ipsen observed a rise in temperature in the skin of the soles of the feet, which may persist up to ten days. This did not occur when the patient suffered injury by the surgical intervention. In patients who were followed up the mortality in the presence of abnormal temperature curve amounted to from 75 to 80 per cent. With local anesthesia the reports were contradictory.

However, all the measurements taken heretofore are limited only to certain areas. The author, therefore, undertook the taking of simultaneous measurements on large or different areas of the skin and the interior of the body. For this purpose he utilized thermo-electric thermometry and the recording with the Siemen six-color recorder. A detailed description of the apparatus should be read in the original. The figures are not absolute ones, but only the variations in temperature under certain surgical conditions should be given. A definite agreement with shock temperatures taken with a mercury thermometer was noted to a great extent.

The temperature in healthy persons not operated upon was tested during a stay in bed, while being transported on a carriage, during and after the transport to the operating room, and while on the operating table, respectively. The temperature of the interior of the body is around 37 degrees C. The author's measurements confirm former findings. The temperature of the stomach was usually higher than that of the rectum but strict regularity was not the case. The temperature of the musculature may be higher than that of the rectum. The behavior of the temperature of the interior of the body is generally uniform in all areas, in contrast to the temperature of the skin, which is subject to very great variations for obvious reasons. The author found that in bed the temperature of the entire body averaged from 34 to 35 degrees C., and on the operating table there was a marked cooling at the periphery, but not in the skin of the trunk. During transport the temperature was somewhere between the extremes. There was a striking constancy of the temperature of the face, especially on the forehead. Psychic and mechanical factors may produce variations, and pathological organic changes in the nerves and vessels responsible for the warmth of the skin in the affected portions of the skin produce variations.

The author made his own measurements on 79 surgical patients before, during, and after operation for ten days. The patients were divided into 2 groups: those that were and those that were not endangered by the operation. The author first considers the results in operations under general anesthesia in patients not endangered by the operation. About five to ten minutes after the anesthesia the temperature of the skin rises to its former level from wherever it had previously fallen during the transport and deposition of the patient on the operating table. However, wherever it remained unchanged up to the time of the onset of the anesthesia, namely, on the trunk of the body and the face, there was a slight cooling of from 0.5 to 1.5° C. It ran parallel to the temperature of the interior of the body. A special susceptibility was found on the hands and feet. The author confirms the view of Ipsen that this is a much surer sign of the actual onset of anesthesia than the loss of other reflexes. It may amount to from 10 to 12° C. and lasts from ten to twenty minutes. During the anesthesia this amounts to a few tenths of a degree and during the operation there is a slight cooling of the skin and interior of the body, about 1.0 or 1.5° C. On awakening the temperature rises again and reaches its normal level after three or four hours. This process is explained by a decrease in the vegetative function during the

anesthesia and the operation. As a result of the anesthesia the normal balance between the vasoconstrictor and vasodilator stimuli is disturbed in favor of the latter. Ipsen considers a vasodilating stimulus as unlikely. This process is not the same in all the areas of the skin. The temperature of the subcutaneous tissue behaves like that of the skin. The temperature of the interior of the body cools off. On the return from the operating table there is a cooling of the skin of about 1 to 2° C., and in the interior of the body of about 0.3 to 0.6 degree. However, this cooling is again corrected after thirty minutes.

After the operation, there is a rise of temperature in the first three hours as a result of the recovery of the general metabolism and organic activity, and the later temperatures are referable to the increased metabolism originating from the operative area. During the postoperative course the heat of the skin is strikingly resistant to external cooling for about eight or ten days. The author attributes this to the increase in the minute volume with a slightly increased or persistently the same amount of circulating blood in persons who have not been endangered by the operation (Rehn Clinic). This persistent elevation of the skin warmth has another cause than the increase in temperature at the beginning of the anesthesia for the skin cools off again if only an anesthesia and not an operation has been done. Interventions on the surface of the body have less effect upon the circulation and metabolism than those on the body cavities. Chloroform and avertin are more toxic than ether, nitrous oxide gas, or narkogen. However, variations occur also in patients not endangered by an operation, as in certain positions on the operating table, and the feet remain cool in operations for hemorrhoids in the lithotomy position when they are elevated; with excessive stimulation of peripheral reflex centers; and in operations on the kidney. The consensual perfusion of symmetrical portions of the body also plays a rôle; it is a nervous reflex process. The investigations carried out by the author seem to show that it acts differently under anesthesia. However, this question must still remain open. Observations on a female patient with acrocyanosis, in whom the stellate ganglion was removed, give the author the right to assume that important tracts of the heat regulation are in the sympathetic ganglia and nerves and these are normally subdued during the anesthesia.

The author then discusses the regulation of heat in patients not endangered by operation under local anesthesia. The anesthesia causes relaxation, while the operative intervention is a stimulus. This is evident under local anesthesia, as the temperature in the interior of the body rises slowly toward the end of the operation or it undergoes no change at all, whereas the temperature of the skin and subcutaneous tissue falls. One or two hours after the operation the temperature again becomes normal. What then is the origin of the temperature in the interior of the body? This was determined also by Voss, Starlinger, Heinold and Loebell. In the first place, it is psychic stimulation associated with muscular tensions, and then a certain amount of heat stasis under the covers is also a cause. The author excludes the effects of novocaine, adrenalin, morphine, and atropin. It is an interesting fact that neither pain, a laparotomy, a cystotomy, nor division of the arteries changes the heat economy. However, there are exceptions, as, for example, in the separation of the poles of the thyroid gland in thyroidectomy, in which the author found a regular rise of the peripheral skin temperature, and he attributes the increased hemorrhage from the skin to stimulation of the carotid sinus. Indeed, this heating occurred from three to five minutes earlier in the arms. Furthermore, he also observed this striking occurrence twice in Bassini herniotomies, in which blood clots were sponged out with sponge holders from the posterior abdominal wall in the region of the roots of the mesentery; and in brain tumor operations, immediately after the splitting of the dura.

Under spinal anesthesia, the heat formation in the anesthetic area is decreased, that is, the temperature of the skin increases on the legs, whereas it remains normal in the remaining skin area. The temperature of the interior of the body, however, behaves exactly as under local anesthesia.

The heat economy and surgical intervention in patients endangered by an operation is then discussed. The author, like Rehn, differentiates shock as the sudden trauma (including also operative shock) from collapse, the condition setting in later. However, both conditions present failure of the vegetative functions with a high degree of acidification of the blood, a marked diminution of the amount of circulating blood, and a lowering of the minute volume. The peril from the operation may be produced by constitutional factors or by disease. Even though the picture of the heat economy shows a great diversity there is a sharp line of demarcation. The diminution of heat formation is more marked and of longer duration (from 2 to 3 degrees C. on an average as against 1.5 degrees C.). The final temperature is reached only after from six to eight hours. Ipsen calculates the operative mortality after the absence of the rise in temperature of the feet according to degrees: mortality with 0 to 2 degrees C. 44.4 per cent, 2 to 4 degrees 26.1 per cent, 4 to 6 degrees 9.5 per cent, and 6 to 8 degrees 0 per cent. Among 17 cases with deficient warming, the author had a mortality of 6 (35 per cent). The curves also show how correct Rehn is with the differentiation between shock and collapse, inasmuch as the shock disappears from five to eight hours after the operation. A subsequently renewed failure indicates collapse. Free transitions occur. There is an important parallel between the heat formation and the amount of the circulating blood. With a decrease in the latter there is a choking-off in the skin periphery without increased limitation of the heat production as long as compensation is not

possible. If the heat formation also is reduced then there is the greatest possible danger.

The effectiveness and ineffectiveness, respectively, of the circulatory stimulants, as well as of intravenous infusions, are similarly reflected in the curves of the heat economy. Veritol and the thyrotropic hormone also act no differently. Only an increased heat protection is effective here. The author then also mentions the favorable effect of the measures recommended by Karitzki in the onset of shock: heating with the light arc for twenty minutes with infusion of 1,000 c.cm. of Ringer's solution intramuscularly and 10 c.cm. of camphor. In this way a secretion of sweat with deacidification of the blood is produced. Whenever the secretion of sweat does not occur, severe organic changes are present. The findings of Karitzki are in direct contrast to the experimental experiences of Rein, who observed the occurrence of collapse in exsanguinated and excessively cooled animals on the application of heat. However, the conditions in human beings who have been operated upon are different, inasmuch as the application of heat is supported by filling of the circulation and analeptics. The author does not discuss the effect of blood transfusion in shock upon the formation of heat. Many curves, tables, and detailed histories are presented.

(Franz) Louis Neuwelt, M.D.

ANTISEPTIC SURGERY; TREATMENT OF WOUNDS AND INFECTIONS

Linberg, B. E.: The Treatment of Non-Penetrating Firearm Wounds of the Skin and Muscles. *New Surg. Arch.* (Russian), 1938, 163: 320.

All bullet wounds are primarily infected, but from the clinical point of view penetrating bullet wounds may be considered as aseptic.

Rubber used for tourniquets cannot be preserved a long time; furthermore, the intensity of the constriction cannot be well estimated. Therefore the author constructed a metal cylinder 13 cm. long with a diameter of the oval cross section 2 by 3 cm. The cylinder contains two parallel longitudinal canals and a twisted twine 1 cm. thick is introduced through one opening and carried back through the other so that a loop is formed. The twine may be replaced by a ribbon. The loop is placed around the injured extremity and a knot is tied with the ends of the twine protruding from the metal cylinder. The latter prevents damage of the skin. A towel or the patient's clothes are placed between the loop and the skin to prevent excessive constriction. The gadget can be sterilized, is indestructible, and allows modifications of the constriction in the course of the operation. For instance, the pressure may be released temporarily to facilitate the finding of severed blood vessels after amputation.

If the wound is seen during the first few hours after the injury, if the anatomical conditions are suitable, and if asepsis and qualified surgeons are available, complete excision and primary suture are recommended. This procedure is usually successful in 90 per cent of the cases. If the patient is seen from eight to twenty-four hours after the injury, a partial débridement and placing of untied sutures are followed by a rapid cicatrization in approximately 60 per cent of the cases. The sutures are placed but not tied until from three to five days later. If the patient comes under observation twenty-four hours or more after the injury, the author recommends a toilet of the wound and irrigation with Dakin's solution, potassium permanganate (1:2,000), chlorazide, or an alcoholic solution of iodine (1:1,000). In this group a secondary suturing is successful in about 90 per cent of the cases.

To prevent absorption of infectious material and to create a lymph flow toward the wound, a 5 to 10 per cent solution of gelatine or gum acacia, or alcohol compresses may be applied. Some authors recommend the use of sodium chloride tablets or sugar to create hyperosmotic conditions.

Severely infected wounds are treated by the author with compresses saturated with such solutions as hot potassium permanganate and rivanol. If the wound is dry, hypertonic saline solutions are applied. If the healing course is favorable, ointments are used; while excessive granulations are treated with various powders. This treatment is supplemented by fractional blood transfusions and the administration of calcium.

Joseph K. Narat, M.D.

Gautier, J.: The Treatment of Burns with Infra-Red Rays (Traitement des brulures par les rayons infra-rouges). *Presse méd.*, Par., 1939, 47: 139.

The general symptoms developing after severe burns bear a striking resemblance to the condition aptly designated by Leriche as "postoperative disease." It is for this reason that the author advocates the use of infra-red rays in the treatment of severe burns. For the past two years the author has operated under continuous infra-red irradiation combined with a terminal ultraviolet irradiation. The marked change in the postoperative condition, and the analgesia thus obtained, encouraged him to try its effect in burns. This method has enabled him to cure without pain, without dressings, and more rapidly than with tannic acid. In the beginning he used both infra-red and ultraviolet rays, but later he used infra-red rays exclusively. He reports in detail 3 successfully treated cases and 1 case in which treatment did not save the patient, probably because it was instituted too late, other methods having been tried first, and other complications had developed. Early application of the rays is an essential for success, and once the lesions have become infected the treatment is of little avail. However, the irradiation may be used following other treatments such as picric acid. Irradiation should be begun while the lesions are being cleaned. After from one-half to three-quarters of an hour of irradiation, the pain will begin to subside and no sedatives or analgesics will be needed. The patients sleep comfortably during the first night.

After each sitting of one hour the patient is returned to bed without dressings, under a sterile screen surrounded with electric lamps to prevent chilling, if necessary. Immediately after the first irradiation the oozing is markedly diminished, and after the third or fourth sitting the lesions are covered with a crust which furthers epidermization in the same manner as that produced by tannic acid. The wound dries up rapidly, in proportion to the frequency of the sittings, within a given period. For this reason the author recommends two sittings of one hour each daily, this dosage also serving to maintain analgesia and diminish shock. In patients who have not been traumatized a thin crust forms, but in regions exposed to irritation, as the back for instance, a thicker crust forms. Nevertheless, cicatrization is perfect. The crusts may fall of their own accord; if not, a moist compress is applied on the sixth day or a little later. Thus, cure is obtained by the sixth or eighth day except in the most severe burns, which may require twenty days.

In burns involving the folds of the joint regions, the limb may be held in slight flexion. This should be corrected, for even if extension breaks or cracks the crust which has formed, it will readily re-form in the correct position. Lambret has recently emphasized the favorable effect of infra-red rays on the humoral syndrome of extensive burns, as has been observed also in postoperative conditions. These rays have also an anti-infectious action. Suppuration did not develop in any of the cases treated. Of course a more extensive burn will require more prolonged treatment than one of small extent. Epidermization following this treatment is perfect in second-degree burns, and to a less extent also in third-degree burns. The scars are smooth and elastic.

EDITH SCHANCHE MOORE.

Callander, C. L., Haim, A., and Maximov, A.: Gas Gangrene: An Analysis of 109 Cases Encountered in Civil Practice. *Am. J. Surg.*, 1938, 42: 811.

Gas gangrene occurs far more frequently than is commonly supposed, especially in localities having active emergency services. From the high death rate, the inference is drawn that early recognition and proper treatment are frequently lacking. Sufficient stress has not been placed on the bacteriology of the condition, and it is thought that closer cooperation between the surgeon and the bacteriologist will result in progress in the treatment of the disease.

It is unusual to find a single anaerobic infection in a case of gas gangrene; usually there is more than one strain of anaerobe present, and not infrequently aerobes, which complicate the picture and produce favorable conditions for the multiplication of anaerobes. The clostridia most commonly cultured in cases of gas gangrene are: (1) clostridium welchii (bacillus aerogenes capsulatus; bacillus perfringens), (2) clostridium edematis maligni (vibrion septique); clostridium novyi; clostridium edematiens); clostridium sordelli; and clostridium histolyticum. These organisms are of exceedingly wide-spread distribution. The spores are likely to persist indefinitely on anything that can be contaminated by dust or dirt. It is impossible to differentiate the members of the group on a morphological basis, and the cultural isolation usually takes too long to be of practical clinical use. One of the interesting features of experimental gas-gangrene infection is that the anaerobes are absolutely harmless unless they are in combination with their toxic metabolic products, or are allowed to form these products in necrotic or crushed tissue. In the human laceration and crushing of tissues, effusions of blood, interference with circulation, fractures, and foreign bodies are all predisposing factors which create local conditions favorable for the growth of anaerobes. Not only does the toxin of one species of anaerobe favor the growth of other species, but an aerobic infection associated with anaerobic infections also produces more favorable conditions for the growth of anaerobes. An interesting observation is made in that granulation tissue, although often exposed to anaerobes, never permits their growth.

In addition to the disease occurring in crushing and lacerating injuries, it is more likely to occur in injuries to the gluteal and perineal regions, or following a clean amputation through relatively avascular tissues. Cases of gas gangrene have occurred from hypodermic and intramuscular injections. The evidence in these postinjection cases seems to indicate that the spores are not necessarily introduced, but that spores probably lie latent in healthy tissues, especially in the aged. Experimental evidence seems to confirm this conclusion.

The pathological changes of swelling and necrosis in the muscles are described. These changes result from the powerful exotoxin liberated. Bubbles of gas travel within fascial planes and vasculoneural bundles, but may rupture and rapidly spread. Microscopically, there is a striking absence of inflammatory reaction.

The local manifestations are much more important for an early diagnosis than the general manifestations of fever and pain. Swelling, reddened wound edges, serous and serosanguinous exudate, and gas bubbles as shown by x-rays are much more reliable clinical findings, and should indicate smear and culture tests of the exudate from the depths of the wound. Any wound which shows large grampositive rods should be suspected of harboring a possible gas-gangrene infection. Cultures in meat or brain broth may be helpful.

The prognosis depends upon the duration and severity of the infection. In this series of 109 cases the death rate was 51 per cent. Infection in the lower extremities resulted in a much higher death rate than that in the upper extremities.

The prophylactic treatment consists of the débridement of all lacerated wounds, compound fractures, and gun-shot wounds. Smears and cultures from these wounds should be made at the

slightest suspicion of trouble. The prophylactic use of serum is still experimental. If serum is given prophylactically a full therapeutic dose should be given subcutaneously; it should consist of:

10,000 units Welch antitoxin
10,000 units edematis maligni antitoxin
200 units novyi antitoxin
200 units sordelli antitoxin
25 units histolyticus antitoxin.

If the disease develops, wide incisions should be made longitudinally in the affected areas. Irrigations with Dakin's or Pilcher's solution are also recommended. Polyvalent serum should be given intravenously in large amounts (100,000 to 150,000 units). Oxygen inhalations and supportive measures are helpful. The use of x-rays and sulfanilamide appears to be of some value, but is still in the experimental stage. If gas gangrene persists, amputation must be performed. It is best to avoid muscles if possible and incise only through tendons. A tenoplastic amputation through the knee joint is described. LUTHER H. WOLFF, M.D.

SURGICAL INSTRUMENTS AND APPARATUS

Pickrell, K. L.: Studies on Hypersensitivity to Catgut as a Factor in Wound Disruption. *Bull. Johns Hopkins Hosp.*, Balt., 1939, 64: 195.

The author found it impossible in his experiments to sensitize either guinea pigs or rabbits to commercial catgut or to an extract from catgut. No evidence of either local sensitivity or general reactions could be elicited in guinea pigs or rabbits subjected to the previous absorption of catgut. It was not possible, by means of the intravenous injection of this material, to produce anaphylactic shock in guinea pigs that had been previously treated with either catgut or catgut extract. Serological tests for antibody production in animals treated with catgut were negative.

No wound disruptions occurred in either rabbits or guinea pigs which had been previously treated with catgut when proper aseptic precautions were used. Although catgut implanted intradermally in both rabbits and guinea pigs caused an inflammatory response, the leucocytic emigration was no greater in these animals than in those which had been treated previously with catgut or its extract.

In the human being no evidence of sensitivity could be demonstrated following the disruption of 3 surgical incisions that had been closed with catgut. In 100 clinical cases in which catgut had been used, tests for sensitivity to catgut extract were carried out pre-operatively and then one month following operation. In no case was sensitivity demonstrable. The author concludes that although catgut, like any other suture material, acts as a foreign body and causes slight leucocytic response, it does not act as an antigen to induce the hypersensitive state.

JACOB M. MORA, M.D.

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Brailsford, J. F.: Simple Radiographic Methods for the Localization of Foreign Bodies. *Brit. J. Radiol.*, 1939, 12: 65.

The routine procedure used by the author is anteroposterior radiography of the extremity with a metal pointer resting on the x-ray film and pointing to the wound. This permits the estimation of the relative position of any foreign body which may be present at the wound in this plane. Over the site where the foreign body is situated, metal markers of iron wire such as are illustrated in Figure 1 are fastened to the skin with adhesive plaster. The extremity is now placed in the position it will assume during the operation and anteroposterior and lateral films are taken with the tube centered over the metal markers. These radiograms will give an accurate estimate of the position of the foreign body relative to the markers, as illustrated in Figure 2. Under that portion of the marker which is shown by the radiogram to overlie the foreign body, a small cross is made and the adhesive tape and marker are removed. The author finds that the cross is best made with a sharp scalpel followed by the immediate painting over with iodine.

When the foreign body is situated in the spine, pelvis, hip, or shoulder joint and an estimate of its depth and relationship to bony structures cannot be determined from anteroposterior and lateral radiograms, the author uses a modification of the method of Mackenzie Davidson. In this method two exposures are made on one film; the tube, at a known height from the film, is shifted a known distance between the exposures. A metal marker is attached to the skin before the exposures are made. A double image is thus obtained. The distance between any two shadows of the same point in an object can be measured on the film by compasses and the accurate depth from the skin can be readily determined by the use of a scale illustrated in Figure 3.

On the line AB the distance of the focal spot of the x-ray tube from the film is measured, a distance of 15 to 20 in. being optimum. The vertical line AC represents the tube shift between the two exposures, 6 cm. being a good standard. On the vertical line drawn at D the distance between the two identical points of the image of the foreign body is measured by compasses and is here represented as DF. If a thread is drawn taut between C and F it will cross

Fig 1.

Fig 2.

Fig. 1. Design of wire marker to be affixed to the skin over the site of a foreign body.

Fig. 2. Radiogram of a round shrapnel bullet in the thigh, showing method of locating foreign body with the aid of four markers. Patient fixed in the position for operation.

AB and the distance of the point at which it crosses, which is here represented as X, from the point D is the depth of that point of the foreign body from the film surface. If now the measurement between the shadows of a point on the metal marker affixed to the upper surface of the skin is made, its depth from the film surface can readily be determined and from these two measurements the distance of the foreign body from the metal marker is obtained by subtraction. In a like manner the respective depth from bony outlines can also be obtained. The radiologist's report should state, in addition to the depth of the foreign body, its relationship to any important anatomical landmarks which the surgeon will encounter or be guided by at the operation.

In the case of superficial foreign bodies in which there is frequently a hard nodule under the skin, a metal marker is fastened over the nodule, and a double radiogram taken. Localization may be made in a manner similar to that above described.

For the injection of sinus tracts the author uses a mixture of 25 per cent bismuth carbonate in vaseline. This mixture is drawn into a large 50 c.cm. syringe when warm and is then allowed to cool. The form of a core in which the opaque material leaves the syringe is of material assistance in outlining the sinus.

In conclusion, the importance of early radiography and quick detection of gas gangrene is stressed.

HAROLD C. OCHSNER, M.D.

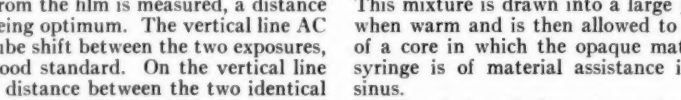

Fig. 3

Blady, J. V., and Hocker, A. F.: The Application of Sialography in Non-Neoplastic Diseases of the Parotid Gland. *Radiology*, 1939, 32: 131.

The roentgen visualization of salivary glands after injection of lipiodol into their ducts has made possible a definite advance in the study of diseases of these organs. This paper is based upon observations made in connection with 38 cases of non-neoplastic diseases of the parotid gland. These cases are tabulated as to their nature. In each the clinical, the histological (whenever available), and the roentgenographic findings have been correlated. The technique of injection and examination is briefly described and the various conditions discussed are illustrated.

In inflammatory lesions the roentgen appearance depends upon the degree of changes resulting from the infection. In acute cases, a distention or beading (or both) of the ducts usually occurs and small alveolar dilatations are noted in the gland. Later large cystic dilatations may form from coalescence of the cavities. Chronic recurrent parotitis may show changes similar to those observed in acute cases. In epidemic parotitis and in miliary abscesses following streptococcic and typhoid septicemias, identical roentgen changes have been reported.

Obstructions of Steno's duct due to calculi, stricture, or extrinsic pressure also produce characteristic changes demonstrable by sialography. With calculi, a filling defect or point of obstruction may be shown with dilatation of the duct proximal to the obstruction. These findings are especially valuable when the calculus itself is not visible on plain roentgenograms. A stricture or stenosis of Steno's duct is generally easily recognized by means of a lipiodol injection. When there is only partial obstruction, dilatation of the duct proximal to the narrowing may be demonstrated. Compression obstructions may be revealed by narrowing of the lumen or displacement with proximal dilatation of the duct system.

Parotid fistulas are readily demonstrated by sialography. The duct system and the point of origin as well as the ramifications of the sinus tract are clearly revealed by the injected lipiodol.

In xerostomia, the entire duct system, and especially Steno's duct, has a much smaller lumen than is normally seen. The injection of a minimal amount of lipiodol results in diffusion of the opaque media into the gland parenchyma.

Examination of a case of Mikulicz disease revealed a normal duct system but a low threshold tolerance for lipiodol, as 1.25 c.cm. readily diffused throughout the gland substance.

Extraparotid disease simulating lesions within the gland may readily be differentiated as with the aid of sialography a normal duct system is revealed. This may be of considerable value in connection with treatment in doubtful cases. In connection with trauma or operative procedures, valuable information may be derived from sialographic studies relative to either Steno's duct or the parotid gland.

ADOLPH HARTUNG, M.D.

Mulsow, J. E.: Roentgenological Study of the Hypopharynx, Larynx, and Trachea: Its Use in Laryngeal Diagnosis. *Arch. Otolaryngol.*, 1939, 29: 326.

This paper is largely a review of the roentgen findings reported by various authors in connection with the normal larynx and pathological conditions such as carcinoma, tuberculosis, syphilis, and paralysis of the vocal cords. Brief references to personal investigations are made and the technique used in the studies is described. In the author's summary it is stated that conclusive diagnostic information may frequently be obtained by roentgenological study and that the latter is of especial value and importance when indirect or direct complete inspection of the larynx is difficult or impossible.

ADOLPH HARTUNG, M.D.

Anspach, W. E.: Bronchiectasis, Collapsed Lung, and the Triangular Basal Shadow in the Roentgenogram; Their Interrelationship. *Am. J. Roentgenol.*, 1939, 41: 173.

Recent investigations, based both on necropsy findings and on observations of the etiology, nature, and ultimate fate of the triangular shadows at the base of the lungs revealed in roentgenograms of the living over long periods of time, have pointed out a very definite interrelationship between bronchiectasis, collapsed lung, and these shadows. The author has found such shadows in approximately 1 per cent of several thousand pulmonary roentgenograms of children examined and, in cases which came to necropsy, it seems evident that atelectasis due either to an obstruction of the main bronchus to a lower lobe, or of many fine bronchi, usually of the second and third divisions, accounts for the triangular shadow, and under certain conditions is a precursor and not merely an associated finding of bronchiectasis.

The triangular basal shadow usually makes its first appearance in early childhood in the course of what is commonly diagnosed as a lower lobe pneumonia. It persists after the acute symptoms of the infection have subsided and after several months bronchial dilatations within it can be demonstrated with the aid of injections of iodized oil. If the triangular shadow shows marked fluctuations in size and density from one examination to the next, which start shortly after the acute symptoms of onset, clearing finally occurs without the development of bronchiectasis or with the development of tubular dilations only. Patients in whom the size and density of the triangular shadows fail to fluctuate over long periods develop saccular bronchiectasis.

Necropsy findings tending to confirm the clinical observations are described and the pathogenesis is correlated with these findings. Attention is called to the fact that bronchoscopic aspiration is of definite benefit and disappearance of the triangular density may follow in a short time, or the shadow may become fluctuating and eventually leave few residual changes.

ADOLPH HARTUNG, M D

Benassi, E.: Does Hepatosplenography with Thorium Dioxide Deserve to be Completely Abandoned? (L'epatosplenografia col biossido di torio merita di venire completamente abbandonata?) *Radiol. med.*, 1939, 26: 81.

On the basis of his latest observations and of the literature, which, however, is scarce and in general not very favorably inclined toward hepatosplenography with thorium dioxide, Benassi thinks that the prudent but not pessimistic conclusions which he drew in 1934 are still valid now. The elimination of thorium dioxide is so slow that the histiocytary impregnation by this opaque substance must be considered as permanent for practical purposes; consequently, this substance should not be used too indiscriminately and should be reserved for cases in which a real and useful diagnostic response can be expected. It is evident that, in consideration of the protracted presence of thorium in the organism and of its radioactivity, even if it is only slight, the possibility of eventual damage to the organism cannot be excluded with certainty. Undoubtedly, the tissues react to the impregnation with changes which may be in part irreversible, but up to the present time no clinical observation has been presented which allows acceptance of a veritable damaging action by thorium dioxide on the healthy organism or during the course of any disease. The only legitimate, but hitherto completely hypothetical, reservation that can be made concerns the possibility of very late damaging effects caused by the radioactivity of thorium; but these fears are much allayed by the weakness of the radiating action of the substance and by the negative results of the observations which have already extended over several years.

The usefulness of hepatosplenography resides in the reliable demonstration of the size of the liver and the spleen and, although the thorium-dioxide method has not fulfilled all the hopes that were based on it, its complete rejection is not justified because there are cases in which it is of great diagnostic usefulness and in which it should be used without excessive fears. Its principal indications are the necessity of knowing the form and position of the liver or the spleen in order to solve an important diagnostic or therapeutic problem (especially in the differential diagnosis of tumors of the hypochondrium); the necessity of obtaining information as to the presence or absence of hepatic tumoral metastases in order to establish the eventual indication of surgical intervention on other organs, or to make a diagnosis; the well founded suspicion of the presence of a hepatic abscess or cyst, the diagnosis of which cannot be made in any other way; the study of the gravity and of the course of special cases of cirrhosis of the liver; the opportunity of following step by step the changes of the liver or the spleen, or disorders located in their interior, with regard to their morbid evolution and their treatment.

Lately a new hepatosplenographic method has been reported by Berg: the substance used is an iodine salt containing 50 per cent of opaque substance and 20 per cent of iodine. The particles of opaque substance have the size of 1 micron. The dose employed is from 200 to 250 mgm. per kgm. of body weight, and is administered in one slow injection. There are no symptoms of iodism, and roentgen visualization of the liver, spleen, gall bladder, kidneys, and urinary passages is obtained. Elimination is rapid. RICHARD KEMEL, M.D.

Pendergrass, E. P., Hodes, P. J., and Garrahan, C. J.: Roentgen Therapy by the Method of Chaoul. *Radiology*, 1939, 32: 142.

The Chaoul method of roentgen therapy consists of contact or near-contact application of low voltage (45 to 60 kv.) rays. Modern shock-proof equipment and improved tube construction have made much irradiation feasible, and experience has demonstrated certain advantages of its use.

The high tension generator, tube, and cooling device used are described briefly. Physical data relating to the use of the method are discussed at some length. These include the dosimeter, intensity of radiation, quality of radiation as expressed by the half-value layer, focal spot, radial variations in intensity, variation of intensity with distance, back scatter, and depth dose. A number of graphs are included to illustrate practical aspects of some of the physical data.

The authors' clinical application of the method has extended over a period of eighteen months, during which time 80 cases were treated, including both benign and malignant lesions. As regards dosage, the daily dose per field has varied from 100 to 400 roentgens in air. In some instances, as many as 3,000 roentgens have been delivered at one sitting without injurious results. In the majority of cases, from 400 to 450 roentgens given at one time produced a threshold erythema. Doses as high as 9,000 roentgens have been given over a period of twenty-five days to one portal with no ill effects. The authors' experiences with skin reactions and subsequent repair have been similar to those described by others. The reactions varied with the doses given and invariably were followed by prompt healing without untoward secondary skin changes.

Among the benign conditions treated, angiomas, warts, keloids, vernal catarrh, pruritus ani, rectal condylomas, and infections are discussed both as to results and the technique used. Practically all of these lesions showed favorable responses. Treatment of malignant neoplasms was limited almost entirely to lesions of the skin, lips, and easily accessible portions of the mouth. Approximately 30 such cases were subjected to this form of treatment with very satisfactory results. Two failures occurred in advanced lesions in which superficial healing took place but the deeper portions were unaffected. Attention is called to limitations of the method in connection with deep-seated lesions, those which are not readily accessible, or those which are very extensive.

In view of the brief period of experience with the method of Chaoul, no attempt is made to draw any definite conclusions. In summarizing their observations, the authors state that low-voltage therapy (Chaoul technique) is indicated as a procedure of choice in lesions so situated that short treatments are desirable. It is a satisfactory therapeutic procedure in selected cases in which it is desirable to obtain the maximum amount of effect in the superficial tissues. ADOLPH HARTUNG, M.D.

Gilbert, R.: Radiotherapy in Hodgkin's Disease (Malignant Granulomatosis): Anatomical and Clinical Foundations; Governing Principles; Results. *Am. J. Roentgenol.*, 1939, 41: 198.

This is a detailed report on Hodgkin's disease, which is backed by a large personal experience of seventeen years and is divided into two parts. Part I deals with the anatomical and clinical features, the evolutionary aspects, and the diagnosis of the disease, and Part II deals with the various treatment angles, especially the value of roentgen therapy.

The following general conclusions are drawn:

1. Because of the high degree of radiosensitivity of essentially lymphoid elements of Hodgkin's disease, systematic roentgen therapy is the treatment of choice.

2. Diagnosis should be made early and, whenever possible, by biopsy.

3. The roentgen therapist must act as a clinician and "track the disease in all its haunts."

4. The effect of the irradiation is direct and destructive (cytolytic); it is followed by fibrosis, which enhances the spontaneous process often observed when the disease is allowed to go untreated.

5. The aim of treatment is to obtain as frank and as long remissions as possible; therefore irradiation must include the methodical destruction of all granulomatous foci without, however, jeopardizing the general condition of the patient or influencing the blood picture too unfavorably.

6. Segmental roentgen therapy satisfies the above requirements best; panteleroentgen therapy seems contraindicated. The irradiation is carried out with from 170 to 200 kv., 1 mm. of copper, and 1 mm. of aluminum for screening, large fields, up to 400 sq. cm., and from 35 to 60 cm. skin target distance. An incident dose up to 250 roentgens on the skin is given to each invaded region in succession until a minimal total depth dose of 500 roentgens is reached on the focus, the duration of the series being about five weeks.

7. If a large tumor has not completely disappeared, the irradiation may be repeated in six weeks, or later, whenever a recurrence develops. Prophylactic or "maintenance" roentgen therapy is superfluous and, through its effect on the blood, even detrimental.

8. The roentgen therapy, apart from palliative relief, produces prolongation of the average duration of the disease and, in a smaller number of cases, leads to long-term survivals. An extensive statistical survey made by the author revealed that the average life span in cases of Hodgkin's disease has been increased from a minimum of one year and four months to a maximum of four years and six months, and that in certain instances (author's cases) as many as 34.3 per cent of the patients treated have surpassed the five-year period.

A bibliography of 258 articles is appended.

TRAIAN LEUCUTIA, M.D.

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

John, H. J.: Surgery and Diabetes. *Ann. Surg.*, 1938, 108: 1052.

Since the use of insulin in the care of diabetic patients, the surgical mortality rates in this type of case have decreased tremendously. An average of a series of 1,767 cases reported before the advent of insulin showed a mortality rate of 20.6 per cent while in 9,513 cases reported since 1923, the mortality has been only 6.7 per cent. There are still tremendous variations in the results reported. These range from 1.2 to 6.8 per cent.

Surgery in diabetic patients carries a greater than normal risk, not because of the diabetes *per se*, but because of obesity, arteriosclerosis, advanced age, and the dangers of infection.

Cholecystitis is common among diabetic patients, and the removal of the gall bladder usually improves the diabetic condition.

Surgery of the extremities for gangrene is a special problem encountered in diabetes. The best treatment for gangrene is prevention, since the mortality rate in this type of operation is necessarily high, because of the advanced age of the patients and the shock occasioned by amputation.

The proper care of a diabetic patient who has an operation demands the combined services of an internist and surgeon who are interested in the disease. The best results are obtained where there is the best team work.

The most important diagnostic problems encountered in connection with surgery on diabetic patients are: (1) the differentiation between acute appendicitis and diabetic acidosis; and (2) the proper diagnosis of unconsciousness which may appear following an operation. The latter may be caused by surgical shock, diabetic coma, hypoglycemia, or alkalosis. The history and blood chemistry findings are important in making the differentiation from acute appendicitis.

Except in situations that present an emergency, a diabetic patient should be subjected to thorough study before any surgical procedure is attempted. The proper dosage and distribution of insulin must be determined if the diabetic condition is to be kept under control satisfactorily after the operation.

The choice of anesthesia is very important. Chloroform should never be used; ether has a great many hazards. The anesthetics of choice when local or spinal anesthesia cannot be used are nitrous oxide, ethylene, and cyclopropane.

After an operation, the condition of the diabetic patient must be followed most carefully, with repeated determinations of the blood sugar, and adjustment of the insulin dosage, so that both hyperglycemia and hypoglycemia may be prevented. Intravenous administration of glucose solutions may be resorted to, provided the injections are accompanied by appropriate doses of insulin.

SAMUEL KAHN, M.D.

Uihlein, A., Jr.: The Use of Cutis Graft in Plastic Operations. *Arch. Surg.*, 1939, 38: 118.

Few reports of conclusive experimental or clinical studies with the cutis graft which is so easily available have appeared, with the exception of those published in the German literature.

Since 1928 Rehn has used cutis in various operative procedures, and applied the principles derived from his experimental findings in dogs to the plastic repair of human tissues. The results in these cases were so encouraging that gradually the field of application has been broadened. In the article of which this is an abridgment, some of the experiments which led up to the clinical application of the results are briefly outlined. The outline is followed by a description of the operative procedures and by an analysis of the results obtained in the 104 cases in which plastic operations with cutis have been performed in Rehn's clinic.

Cutis contains all the components of skin except the epidermis; it is inherently active; it is composed of a network of connective-tissue fibers. Owing to the stimulus set up by the tension under which the graft must be sewn, these inherent factors assist in the metamorphosis and metaplasia of the graft. The inherent activity of cutis, in contradistinction to fascia which is inactive, accelerates repair by encouraging migration of cellular elements.

Eitel, with the Warburg technique, showed that cutis is more active and lives longer than fascia. Schneider showed that cutis is an excellent material for transplantation because of its content of glutathione.

Rehn's first clinical application was in the repair of large postoperative abdominal hernias. Sixty-five patients with this type of hernia were operated upon by him with encouraging results. Sixteen patients failed to appear for re-examination. Of the remaining 49, 6 presented recurrences from two to nine years after the cutis repair.

The transplant is usually taken from the lateral aspect of the thigh. This area is cleansed prior to operation according to the technique described in the original article. In some cases Rehn has employed the skin of the abdominal wall as the transplant. No iodine should be used in preparing the area from which the cutis is to be taken. For obtaining the graft the epidermis is first removed by the Thiersch method. From this epidermis-free area an oval piece of cutis of the desired size is excised. One centimeter of fatty tissue is included. The wound that is left in the thigh is easily closed with silk sutures.

After assuring adequate hemostasis in the area to which the graft is to be sewn, the cutis is placed over the defect and sutured to the generously exposed muscles and fascia. The transplant is then sutured under tension, with chromic catgut, to these healthy tissues, so that it resembles a taut drumhead after all the ligatures have been securely placed. The skin and subcutaneous tissues of the wound are then easily approximated and closed over the graft in the usual manner.

The unexpected return of two patients, upon whom a cutis operation had been performed four years previously, afforded histological proof of the activity and the resulting metamorphosis of the cutis transplant. The pieces of tissue removed from the area of the transplant presented normal connective-tissue characteristics. The abundant vascularity of the tissue was striking. No epidermal remnant of the original cutis graft and no cystic portions could be identified in the sections.

Repair of recurrent inguinal hernia with the cutis graft was made in 11 cases. In 3 of the patients the hernia recurred after the repair. In the others, evidence of recurrence did not develop until from two to six years after the operation. Frank reviewed these cases in a recent paper.

The operative repair, with a cutis transplant, of a knee joint in which lateral motion was excessive, has been an interesting step in the treatment of this disabling ailment. The cutis graft is a functional equivalent of the weakened ligamentous supports. Rehn exposes the lateral or medial muscle groups above and below the knee through separate incisions. The transplant is sutured to these muscles as described in the original article, under tension, with the knee slightly flexed. At the close of the operation the leg is placed in extension in a plaster cast for a period of weeks. Eight patients with excessive lateral motion of the knee joint have been operated upon in the clinic in this manner. Good functional results were obtained in 6 of these.

A complete analysis of the cases in which the cutis transplant was employed, with an analysis of the postoperative results, can be found in the original article.

Anesthesia must be sufficiently deep to assure complete relaxation of the muscles so that the necessary degree of tension for stimulating metaplasia is sustained after the anesthesia wears off. Spinal and intravenous anesthesia have been tried, but ether given by the open drop method has allowed better relaxation.

Wound infection and hematoma comprise the principal early postoperative complications. Wound infection developed in 15 of the 104 cases in which the cutis graft was employed, and hematoma resulted in 5. In 9 of the 15 patients, there was good healing in spite of the infective process, and recurrence of the pre-operative symptoms was not observed. Rehn attributes the lack of serious complications from infections to the inherent activity of the cutis graft.

Gage, M.: Pilonidal Sinus: Sacrococcygeal Ectodermal Cysts and Sinuses. *Ann. Surg.*, 1939, 109: 291.

Pilonidal sinuses and cysts are of common occurrence. They are derived from that part of the caudal end of the medullary canal located in the tail of the anlage. They are divisible into four groups: (1) sacrococcygeal dimple and sacrococcygeal dimple sinus; (2) true pilonidal sinus, confined to the subcutaneous tissue; (3) true pilonidal sinus extending into the sacral canal; and (4) true pilonidal sinus continuous with the subarachnoid space and canal of the spinal cord.

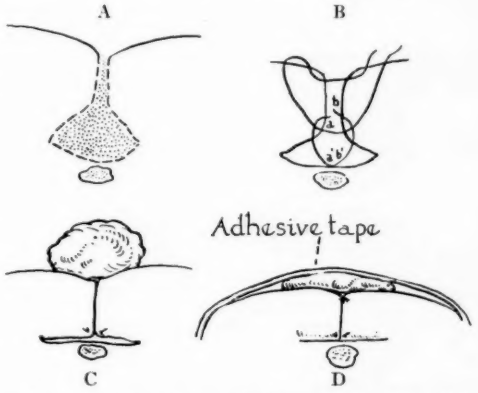

Fig. 1. Drawing (exaggerated) illustrating the defect, following removal of a pilonidal sinus with minimum amount of tissue destruction (A); the sutures used to close the defect (B); subcutaneous defect after suturing (C); and the obliteration of all dead space and approximation of all wound surfaces by "sea sponge" pressure (D).

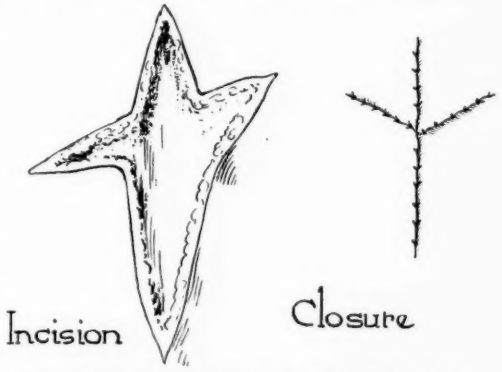

Fig. 2. Drawing illustrating the method of excising the primary pilonidal sinus and the lateral or secondary sinuses and the wound after closure. (Courtesy of J. B. Lippincott Co.)

Complete surgical extirpation of the primary sinuses and cysts, as well as of the secondary sinuses, and primary closure of the wound is the ideal treatment. Complete apposition of all wound surfaces and obliteration of all dead spaces by pressure with a sea sponge must be obtained to get the best results. With this method 42 cases were treated by the author without a single recurrence.

CHARLES BARON, M.D.

Moulonguet, P., Bachy, G., and Dobkevitch, S.: Periosteal Lipoma (Lipomes périostés). *Rev. de chir.*, Par., 1939, 58: 1.

The authors report a case of periosteal lipoma in a man sixty years of age, in whom a swelling developed just above the knee on the left thigh, following an injury at that site from the kick of a horse. Operation was done and the tumor removed. The tumor involved the periosteum, but was implanted directly on the bone; the base of implantation was adult bone with a fatty marrow. Strips of newly formed bone with hematopoietic marrow had invaded the body of the tumor, which was a lipoma. The patient made a good recovery, and several months later there was no sign of recurrence and the patient was able to work.

Lipomas of the periosteum are of rare occurrence, and those that are attached to the bone or show any infiltration of the bone, as in the authors' case, are very unusual. Such tumors may result from trauma or from chronic irritation. In the authors' case, there were no muscular fibers in the tumor tissue. Periosteal lipomas observed in children, which were probably congenital and which showed the histological characteristics of fibrolipomas have been reported.

ALICE M. MEYERS.

Creech, E. M. H.: Carcinogenic and Related Non-Carcinogenic Hydrocarbons in Tissue Culture. *Am. J. Cancer*, 1939, 35: 191.

Many chemically pure substances have been shown to cause cancer when injected or applied to the skin of animals. Little is known, however, concerning the manner in which these substances act on the cell.

Several workers have attempted to study the action of carcinogenic substances *in vitro*. Des Ligneris is the only one who has reported the successful induction of malignancy in this manner. Of 6 fowls injected with tissue which had been treated with 1:2:5:6-dibenzanthracene *in vitro*, 1 is said to have developed a myxosarcoma at the site of injection.

The author's experiments were begun in the hope that a combination of the most advanced cytological technique and tissue culture might throw some light on the nature of the effect of these carcinogenic substances on the cell itself. Fibroblasts from the connective tissue surrounding the ribs of embryonic mice were used. The tissue was grown by the hanging-drop method in a medium consisting of fowl plasma and an extract of nine or ten-day-old chick embryo in Pannett and Compton's solution. The substances to be tested were dissolved in the solution and buffered at a pH from 7.4 to 7.5.

When added to mouse fibroblasts in tissue cultures, 1:2:5:6-dibenzanthracene choleic acid caused an increase in cell proliferation, as compared with the controls, which included cultures treated with phenanthrene choleic acid, acenaphthene choleic acid, desoxycholic acid, and untreated cultures. Desoxycholic acid and phenanthrene choleic acid were found to give a decrease in cell proliferation. The increase in the outgrowth of cultures containing 1:2:5:6-dibenzanthracene choleic acid over that of the untreated controls was approximately 50 per cent.

The chromosomes showed a precocious splitting in the prophase in the cultures treated with 1:2:5:6-dibenzanthracene choleic acid, 20-methylcholanthrene acid, and methylcholanthrene in serum, but not in any of the four types of controls.

Similarities to miosis (reduction division) were occasionally found in cultures treated with 1:2:5:6-dibenzanthracene and methylcholanthrene choleic acid, in which the metaphase chromosomes were lying closely in pairs, the members of these pairs separated later to opposite poles, which resulted in a reduction division, and in the "node and loop" formation of the chromosomes.

During preliminary tests it was found that ether, even in very slight amounts, was toxic to the cultures and produced nuclear changes of a lethal nature. These changes consisted chiefly of chromosome clumping, lagging at the anaphase, failure of the cell to divide, and unequal division. These observations would suggest that certain types of lethal abnormalities of the nucleus found in tumors may be due to the toxicity of the environment in which they develop.

JOSEPH K. NARAT, M.D.

Gray, J. H.: The Relation of Lymphatic Vessels to the Spread of Cancer. *Brit. J. Surg.*, 1939, 26: 462.

For this investigation the author employed India ink and gelatin mixtures for the blood vessels and thorotrast for the lymphatics. Warm skin taken immediately after removal at operation, or skin removed at post mortem and subsequently heated in a bath to body temperature is suitable; but whatever tissue is used it must not be touched by fixatives before the injection, and it must be as fresh as possible. A total of 24 specimens presenting new growths was used for the experiments. All of these were removed at operation so that none of the cases could be said to be inoperable.

The deductions from these investigations may be summarized as follows: the mode of spread of cancer to lymph glands is generally by means of lymphatic emboli of cancer cells carried along in the lymph stream. The results indicate that cancer of its own accord does not generally stimulate a new formation of lymphatic vessels. The ordinary effects of cancer in appreciable masses upon the local lymphatic vessels are not lymphotropic but purely indifferent mechanical effects, leading ultimately to compression

and disappearance of the lymphatic vessels within the interior of a cancer. Lymphatic thrombosis plays very little part in these phenomena. Cancer cells generally do not remain for any length of time within the lumen of a lymphatic vessel; that is, the spread of cancer cells by their growth as cords in the lumina of lymphatics is an unusual phenomenon in cases of operable cancer. When it does occur such permeation seems to be generally only of microscopic extent. The claim that permeated lymphatics and cancer cells present in them are destroyed by thrombotic changes could not be confirmed.

JOSEPH K. NARAT, M.D

Bacon, H. E.: Multiple Malignant Tumors, with Involvement of the Lower Bowel. *Am. J. Cancer*, 1939, 35: 243.

A review of the literature on the occurrence of multiple primary malignant lesions with involvement of the anus, rectum, or sigmoid (omitting malignant polyposis) discloses 145 reported instances with one or more multiple growths in this locality. In 27 instances there were two carcinomas and in 5 instances there were three confined to the anus, rectum, and sigmoid colon. In a larger number of cases other portions of the gastro-intestinal tract were involved, while in a few instances growths were present in systems unrelated to the rectum and sigmoid (breast, larynx, prostate, skin).

Seven new cases are presented in this report, and in addition 3 cases that may well be examples of "contact" cancer.

In instances in which two or three malignant growths, each showing the same histological characteristics, are confined to a relatively short segment of bowel, it is possible that contact implant rather than multicentric origin may explain the presence of multiple tumors.

Six authors have reported instances of carcinoma and sarcoma in the same individual. The tumors arose in wholly unrelated systems.

MANUEL E. LICHTENSTEIN, M.D.

Burke, E. M.: Sarcoma of the Soft Tissues. *Am. J. Cancer*, 1939, 35: 234.

At the State Institute for the Study of Malignant Disease, Buffalo, New York, about 5 per cent of all malignant tumors are sarcoma of the soft tissues. They may arise wherever there is tissue of mesoblastic origin. This study excludes all neoplasms of lymphoid tissues and bone, as well as a specialized group of soft-tissue tumors called myxosarcomas.

The 201 patients in this series included 107 males and 94 females. The upper extremities were the site of the primary growth in 30 instances, the lower extremities in 62. Forty-five lesions were on the thighs, the most common site of origin. In 33 patients the primary site was on the head, face, or neck. In 7 instances the abdominal organs were involved; while in 23 cases the lesion was in the mouth, pharynx, or nasopharynx. The remaining 37 instances involved the chest, abdomen, and back.

The lesions varied in duration from three months to more than thirty years. The lesions of longest duration grew slowest and gave the best prognosis. Rapidly growing tumors caused the patient to seek early treatment, were more malignant, and were associated with the poorest prognosis. In spite of wide excision, recurrences are common and the tumors are prone to metastasize, especially in the later stages of the disease. Sarcoma can be classified into definite histological grades.

Tumors of Grade I are made up of large and small spindle cells with a plentiful stroma of dense fibrous connective tissue of adult type. Round cells are absent and very few mitotic figures are found. This grade, while exhibiting definite malignancy, is histologically similar to the more cellular of the benign fibromas.

Grade II tumors consist of hyperchromatic spindle cells with an infiltration of round cells. Mitosis is more frequent and the growth is more vascular. Some loss of intercellular substance is noted.

In Grade III the tumors display a mass of spindle and round cells, increased mitosis, and vascularity, together with a loss of intercellular substance. An occasional giant cell is found.

Grade IV is represented by the highly cellular spindle-cell tumor, with many giant and round cells. Vascularity is increased and mitotic figures with many irregular forms are abundant. Marked variation in size, shape, and staining qualities is noted in the neoplastic cells.

The prognosis in the higher grades is poor and only a small percentage of patients remain well for a five-year period. MANUEL E. LICHTENSTEIN, M.D.

Bick, E. M.: End-Results in Cases of Fibrosarcoma of the Extremities. *Arch. Surg.*, 1938, 37: 973.

Each case of fibroblastic tumor of an extremity presents an individual problem. Is the tumor benign? If it is border-line or obviously malignant, what is its virulence? Is amputation necessary? Is irradiation necessary? Can one afford to excise the tumor and continue observation for recurrence? On the basis of 24 cases the following answers are submitted:

1. Any fibroblastic tumor of the extremity for which complete surgical excision of a primary lesion is anatomically feasible should be so treated. By complete surgical removal is meant not only removal of the visible tumor tissue but removal of enough of the surrounding normal structure to make sure that there is no residue. The extent of the excision cannot be measured in centimeters; it must remain a matter of surgical judgment.

2. When complete surgical excision is not anatomically feasible, amputation of the limb is imperative at the time the primary tumor is judged malignant by competent study of the gross specimens *in situ*, and by microscopic study of adequate tissue. This is true regardless of the degree of malignancy as judged by the pathologist. It will be found that many fibrosarcomas of the deep fascial tissues of

the thigh, or fibrosarcomas originating in the periosteum of the femur, fall within this category, that is, it is difficult to assure their complete surgical removal.

3. Amputation is imperative at the first sign of recurrence of a fibrosarcoma.

4. It has not been proved that irradiation technique, as applied up to this time, alters the eventual outcome in such cases. Fibrosarcoma is resistant to present-day radiotherapy. JOSEPH K. NARAT, M.D.

DUCTLESS GLANDS

Bernheim, A. R., and Garlock, J. H.: Parathyroidectomy for Raynaud's Disease and Scleroderma: Late Results. *Arch. Surg.*, 1939, 38: 543.

The rationale of parathyroidectomy for Raynaud's disease and scleroderma was suggested to the authors by the following observations: (1) in a patient totally disabled by generalized scleroderma, the accompanying symptoms of Raynaud's disease in the hands and feet were somewhat improved after calcium therapy, and (2) sclerodermatous changes could be produced in both rats and mice by the intraperitoneal injection of parathyroid extract. As a clinical experiment, therefore, parathyroidectomy was performed in the aforementioned patient and an encouraging result was obtained.

The authors review the pathological physiology of hyperparathyroidism, and discuss some of the functions of calcium in the body. As a result of an observation covering a number of years, Bernheim formed the opinion that in certain persons a continued calcium deficiency may increase a predisposition to vasospasm. In diseases in which some of the symptoms are due to vasospasm, relief in a large number of cases followed the use of a diet adequate in calcium.

It is the authors' concept that in cases in which the disease responds to calcium treatment the parathyroid glands are relieved of their extra work in drawing calcium from the bones and may return to a normal physiological state. However, in certain instances improvement does not take place in spite of prolonged and intensive treatment. In such cases more or less permanent change may have occurred (permanent hyperplasia or disturbed function of the parathyroid glands); hence removal of one or more of these bodies seems indicated. It seems conceivable that vasospasm, the occurrence of which in Raynaud's disease is well established, plays a rôle of like importance in scleroderma. In many cases, symptoms of Raynaud's disease and scleroderma occur together.

The histories of 17 cases of Raynaud's disease and scleroderma treated by parathyroidectomy are described and the late results appraised. In most cases of true hyperparathyroidism the calcium content of the blood is found to be elevated and the phosphorus decreased. In no case of this series did hypercalcemia occur. A possible explanation of this difference may be that in the former condition, over-activity of the glands is the result of disease which disturbed the normal relation between the stores and the blood, whereas in the latter normal glands overwork to maintain a normal calcium level in the blood. It was also noted that the inorganic phosphorus content of the blood was elevated above normal in most of these cases. This discrepancy could not be explained.

It was noted in the cases of Raynaud's disease in which the condition was not associated with sclerodermatous changes, that improvement followed immediately after the operation but did not continue. In all such cases the symptoms eventually returned. Improvement occurred in all cases of scleroderma and was maintained in all but one. In a number of cases the greatest improvement in symptoms did not immediately follow the operation but occurred several months later.

There seemed to be no contraindications to the operation. In none of the patients did symptoms of tetany develop at any time, nor were there any other postoperative complications. There was no mortality.

The authors conclude that parathyroidectomy has no place in the therapy of Raynaud's disease. While the immediate results are impressive and often dramatic, the late results do not measure up to the expectations expressed in their original paper. However, in the treatment of scleroderma, whether the condition is generalized or confined to the hands and face, they are of the opinion that parathyroidectomy offers the patient the probability of recession of the disease in the early stages, and of halting of the process in the late ones. At present, no other method of treatment is known which offers this outlook to the patient suffering from scleroderma.

SAMUEL H. KLEIN, M.D.

Heckel, G. P., and Allen, W. M.: Maintenance of the Corpus Luteum and Inhibition of Parturition in the Rabbit by Injections of Estrogenic Hormone. *Endocrinology*, 1939, 24: 137.

The authors have previously shown (1936) that the injection of estrogenic hormone, beginning on the eleventh day of pseudopregnancy, in the rabbit prevents regression of the corpora lutea, and that corpora caused to persist by this means are functional.

The purpose of the present experiments was to determine whether injections of estrogenic hormone would have a similar effect on the corpora lutea of pregnancy. The factors concerned in parturition in the rabbit are not fully understood, but it is established that parturition can be prevented either by the introduction of new corpora lutea or by the injection of progesterone, and the premature delivery can be produced by removal of the corpora.

In a group of preliminary experiments injections of estrogen were begun on the nineteenth, twentieth, twenty-first, or twenty-third days of pregnancy and continued either until delivery had occurred or until the animal was killed at the conclusion of the experiment. The injections were made so that the dose gradually increased, the expectation being that this

method of administration might yield an estrogen level sufficiently high to prevent regression of the corpora and, hence, parturition. The individual experiments show that in no case in which the maximum total daily dose was 175 I.U. or less was parturition prevented from taking place at about the usual time. Animals receiving doses larger than this had macerated fetuses when they were killed on from the thirty-second to the thirty-eighth day. One of these was killed on the thirty-sixth day. The corpora lutea were large and histologically appeared to be normal. The uterus contained 4 macerated fetuses. This suggests that the injections had maintained the corpora and also had killed the fetuses. The main reason for presenting these preliminary experiments is to show that premature delivery does not occur even though a quantity of estrogen sufficient to kill the fetuses is given. This result is contrary to reports in the literature that estrone induces abortion in rabbits.

In the next group of experiments 6 rabbits were injected with estrogen beginning on the twenty-seventh day and 1 beginning on the twenty-eighth day of pregnancy, each receiving from 150 to 500 I.U. daily. In each case this quantity caused death of the fetuses and continuation of pregnancy beyond the thirty-second day, the usual time for delivery; 2 deliveries occurred on the thirty-fourth day, 1 on the thirty-fifth, and 2 on the thirty-ninth day. Delivery occurred in spite of continuation of the injections except in 1 case in which cessation of the injections on the thirty-sixth day was followed by delivery on the thirty-ninth day. The remaining animals were killed undelivered on the thirty-seventh day. In both, the corpora lutea had not regressed as they would have if estrogen had not been given and normal parturition had occurred on the thirty-second day. From these results it seemed evident that the corpora were being maintained by the estrogen and that their continued function was the reason for delay in parturition. Consequently 6 more rabbits were given comparable doses of estrogen but the ovaries were removed on the twenty-seventh day at the beginning of the injections. These 6 all delivered spontaneously on the twenty-ninth, thirtieth, or thirty-first days, 4 of them giving birth to some living fetuses and 2 delivering macerated fetuses.

Another group of 10 animals was given estrogen beginning on the twenty-ninth day of pregnancy, the daily dose ranging from 100 to 1,000 I.U. None delivered on the thirty-second day. All animals receiving between 100 and 375 I.U. daily delivered spontaneously, but in each case, except 1 which delivered on the thirty-third day, delivery was delayed from three to seven days. Two animals receiving doses of 500 and 1,000 I.U., respectively, were killed undelivered on the forty-fourth and fifty-second days. The corpora lutea were examined in 4 animals. One was killed on the thirty-sixth day when delivery occurred; the others were killed undelivered on the thirty-fifth, forty-fourth, and fifty-second days, respectively. The corpora from these were of a size similar to that of late pregnancy and were essentially normal histologically. To show that the corpora must be present for the inhibition of parturition, 5 animals were castrated from one to five days after the injections were begun. Spontaneous delivery occurred within forty-eight hours despite continuation of the injections of estrogen. This was in direct contrast to the results in animals in which similar injections were made but in which the ovaries and, hence, the corpora lutea were intact. These controls were perhaps better than those of the group castrated on the twenty-seventh day because in the latter group the estrogen was given time to exert an effect on the ovaries before they were removed, whereas in the previous group they were removed the day of the first injection.

In view of the finding that injections started as late as three days before term were effective in causing delay, a smaller series was studied in which injections were begun on the thirtieth and thirty-first day. These show several interesting things. Of 3 animals each given 500 I.U. daily beginning on the thirty-first day, only 1 delivered normally; 1 of the others delivered on the forty-first day, and the third was killed undelivered on the forty-fifth day. Incomplete delivery occurred occasionally. One, in which injections of 500 I.U. were begun on the thirtieth day, delivered 1 living and 3 dead fetuses on the thirty-first day, but failed to deliver 5 more. On the fifty-second day a laparotomy was made and both ovaries, which contained large pink corpora lutea, were removed. Death occurred two days later for reasons which were not apparent at autopsy. The foregoing experiments show also that in every case in which a significant delay in parturition was obtained or in which parturition failed to occur the fetuses were dead. The exact cause for the fetal death has not been determined.

A final group of experiments was carried out to confirm the observation by others that estrogen induces abortion in rabbits, and to show that when abortion does occur under these conditions it is associated with regression of the corpora lutea.

The major significance of the experiments, however, probably lies in the observation that the injection of estrogenic hormone, beginning even as late as one day before delivery ordinarily occurs, will cause the corpora lutea to remain functional and thereby prevent parturition, presumably because of the continued capacity of the corpora for producing progesterone. ELLA M. SALMONSEN.

EXPERIMENTAL SURGERY

De Blasi, A.: Experimental Staphylococcic Bacteriemia (La batteriemia sperimentale stafilococcica). *Policlin.*, Rome, 1938, 45: sez. chir. 501.

The contradictory reports on the multiplication of bacteria in the circulating blood induced De Blasi to initiate his experiments to settle this question. He used guinea pigs, two or three months old and weigh-

ing from 400 to 500 gm. which he kept under observation for several days before the experiment. Each animal was given under strict aseptic conditions an injection of pure bouillon culture of staphylococcus pyogenes aureus into the jugular vein, the amount injected varying from a minimum of 0.25 c.cm. for the first groups of animals to a maximum of 0.50 c.cm. for the last groups, and corresponding to one-half of the dose causing the death of an animal of 400 gm. within twelve hours. For the demonstration of bacteria in the circulation, blood culture was used in bouillon or on agar plates, the latter being preferred because it facilitates early diagnosis and correct counting of the number of colonies. The blood was collected by means of a platinum loop from an incision into the marginal veins of the ear two or three, ten, twenty, thirty, forty-five, and sixty minutes, and two, three, four, six, and twenty-four hours after the inoculation and then every day until the death of the animal. Forty-eight guinea pigs were employed:

1. The first group of 15 animals was subjected simply to circulatory infection, this experiment making possible the observation of the behavior of the bacteriemia in the normal guinea pig.

2. The second group of 10 animals was first subjected to an intramuscular injection of 2 c.cm. of a 1 per cent aqueous solution of trypan blue on alternate days for from 5 to 7 times. Two days after the last injection of staining material they were infected; 2 controls were used.

3. The third group of 8 animals was subjected to splenectomy and was infected four days later; 2 controls were used.

4. The fourth group of 8 animals was artificially subjected to hepatic lesions by the oral administration of 12 drops of a 1 per cent solution of phosphorus in oil on alternate days for from 7 to 9 times; 3 controls were used.

The 32 animals which were killed were submitted to a careful necropsy; cultures were made on agar with the blood found in the heart, lungs, liver, spleen, and kidneys, and samples of these organs were collected for future histological examination.

The results obtained allow the following conclusions:

The production of a staphylococcic bacteriemia in the guinea pig with 1 intravenous injection of a large quantity of bacteria does not determine a multiplication of these bacteria in the circulation. There is no demonstrable parallelism between the positivity of the blood culture and the general condition of the guinea pig; often during lethal infections, the blood culture, strongly positive in the initial stage, becomes negative or only slightly positive; this seems to occur also in man. The preponderant importance of the reticulo-endothelial system in blood infections is demonstrated; the progressive (hypertrophy, hyperplasia) and regressive (necrosis) phenomena reveal its hyperactivity, but they do not seem to possess any specific character. Artificially produced lesions of the reticulo-endothelial system and of the liver, splenectomy, and fasting are capable of inducing a more rapid and more serious course of the experimental blood infection. The results obtained in the experimental field cannot be transferred to the clinical field in any case, because the conditions under which the blood infection occurs are not at all comparable, although the means of defense of the organisms against infection should be considered as equal.

RICHARD KEMEL, M.D.